
JOURNAL

OF THE

ARNOLD ARBORETUM

VOLUME VII

APRIL, 1926

NUMBER 2

THUJA ORIENTALIS LINNAEUS

Plate 1.

ERNEST H. WILSON

ONE of the oldest and best known exotic trees in cultivation is *Thuja orientalis* L., the Chinese Arbor-vitae. It was named by Linnaeus in 1753 but he had earlier described it in his *Hortus Cliffortianus* (p. 449) in 1737, where he states that it was communicated by Cl. Royen. Philip Miller had it in cultivation in the Apothecaries' garden at Chelsea before 1752 and in the seventh edition of his *Gardeners' Dictionary* states that "The China Arbor Vitae hath not been long in Europe: the Cones of this Tree were sent from China, by some of the French Missionaries; and since this Sort has been introduced into the English Gardens, it has been greatly propagated by Layers and Cuttings; but the Seeds seldom ripen here." The first mention of it in European literature is to be found in Kaempfer's *Amoenitates*, fasc. v. 884 (1712) under the name of "Fi no ki altera." Whether Royen received it through the Dutch East India Company or whether Miller's version of its introduction is correct I have not been able to discover. In Japan it is commonly cultivated in temple grounds and might easily have been sent direct to Holland by way of Java either as a living plant or as seeds. On the other hand it is abundantly planted in and around Peking and ripe cones, as Miller states, may easily have been sent to France by some Jesuit priest since the first of this order, the famous Matthaeus Ricci, settled in Peking in 1600 and the order has been represented there ever since.

Although known in Europe for nearly two centuries I can find no record of large trees or indeed of specimens showing the real habit of the tree. This is all the more remarkable when its accommodating nature and ease of propagation are remembered. Dozens of forms have originated in gardens and received names, yet a real adult tree seems unknown either in America or in Europe. The books devoted to Conifers, even the very latest, describe it as a bush or tree of columnar or pyramidal habit with erect branches and branchlets and from 20 to 60 ft. tall is given as its height. This description faithfully portrays the tree as we of the West know it, but is far, very far from picturing its real habit. Slow of growth it takes centuries for this tree to obtain its mature form.

During my travels in the Orient I did not see spontaneous specimens

of the Chinese Arbor-vitae, widely cultivated though it is and in many places naturalized. In Korea and Japan it is known only as a planted tree. Its hardiness supports the belief that it is a native of northern China rather than of other parts of the Empire. It is the Poh-tree of the Chinese classics and the fruit, the leaves and the inner bark all have medicinal uses. In the temples the branchlets and pieces of the wood are burnt as incense. In former days the tree distinguished the gardens of princes and sheltered the tombs of emperors, and today it is most commonly met with in gardens and burial grounds. Throughout the New Year festivities, sprays of this fragrant evergreen are used to symbolize long life, happiness and prosperity.

According to J. Hers (in *China Jour. Sci. & Arts*, iv. 81 [1926]) this Thuja in north China likes low altitudes and is never found at more than 1000 m. above sea level. On the plains together with *Populus tomentosa* Carr., *Ulmus pumila* L. and *Salix Matsudana* Koidz. it constitutes eight-tenths of the flora around villages and in graveyards. Here and there throughout north China magnificent planted specimens of this tree may be seen. Hers (l. c.) states that the most famous specimens he has seen are the Sung Yang Kung Thujas at the foot of Sungshan, one of which was already famous at the time of the Han dynasty (B.C. 255–A.D. 221) and that at Tsin Sze, near Taiyuan Fu, which is supposed to date from the Chow dynasty (B.C. 1122–256). He figures one of the giant Thujas in the Sung Yang Temple with a girth of 38 ft. and states that at Wang Kwai Chen on the Tingchow road to Wutai Shan, there is another very beautiful specimen which is about 10 m. in girth at the base. In Peking, notably in the grounds of the Confucian Temple, in what is now termed the Central Park and at the Temple of Agriculture, there are fine avenues and many magnificent specimens of this Thuja. I have been to some pains to find out the age and history of these trees.

In reply to an inquiry Dr. John C. Ferguson of Peking, an esteemed correspondent of the Arnold Arboretum, informs me that "it is very difficult to give information which might be considered scientifically accurate in regard to the trees in the Temple of Confucius. There are, however, certain well-known facts. This Temple was built during the Yuan (Mongol) dynasty and, in accordance with the custom, trees were planted at that time. The local tradition is that the trees now remaining in the main courtyard were all planted when the Temple was built during the Yuan dynasty with the exception of one tree which is said to have been already there and which must therefore belong to the Sung dynasty. The earliest dated tablet in the Temple enclosure was erected in the 11th year of the Emperor Ta Te, i. e. A. D. 1307. As to the trees growing in the park near the palace (Central Park) there is no means of determining their age further than that we know that the oldest of them could not have been planted earlier than the reign of the Emperor Yung Lo of the Ming dynasty, A. D. 1403–1425."

Dr. Carl TenBroeck of the Peking Union Medical College, writing under date of January 27, 1926, gives the following data gathered by one of his assistants from a book, Ju Hsia Chiu Wen K'oa (Old Stories Under the Sun), published about 1800 which is really a collection of references to Peking gathered from old literature:

"There is a definite record of the establishment of the Confucian Temple in the Kin dynasty 1151. There is a further record of various improvements being made about 1434 and a definite statement of 20 trees being planted at this time. The trees there are evidently of two ages and it is possible that the older trees were planted soon after the establishment of the temple. We cannot, however, make a definite statement about this. We have not found any record of when the trees were planted in the Central Park. Kublai Khan, 1279, built palaces and parks and these were rebuilt by Yung Lo shortly after 1400. Just when the trees were planted we cannot say. The first record of the Temple of Heaven that my man has found shows that it was erected by the Kins about 1200. There is a definite record of its having been rebuilt and enlarged the alterations being completed in 1395 at which time Pines and Cypress (Thuja) were planted."

In the past many cities have occupied the present site of Peking. The Hanlin or Imperial Academy was established there about A. D. 755. The Sung dynasty, which lasted from A. D. 970 to 1260, was driven from Peking in 1118 by the Tartars who established themselves there as the Kin dynasty, only to be driven out by the Mongols in 1234. The famous Emperor Kublai Khan made Peking his capital in 1264 and there the great Venetian, Marco Polo, served him as Advisory Minister.

Through the kindness of Dr. W. T. Councilman, the Arnold Arboretum is in possession of a fine set of photographs of these ancient Thuja trees in Peking and this collection has been supplemented by some excellent photographs generously presented by Dr. TenBroeck who also supplies measurements taken with a surveying instrument. The largest tree photographed by Dr. TenBroeck stands in Central Park and measures 47 ft. 4 inches in height with a trunk 18 ft. 9½ inches in girth at breast height and a crown spreading 48 ft. One in the Confucian Temple is 41 ft. 10 inches in height with a trunk 16 ft. 1 inch in girth and a crown spreading 45 ft. 6 inches. Another in the grounds of the Temple of Heaven is 46 ft. 7 inches in height, with a trunk 12 ft. 6 inches in girth, and a crown spreading 47 ft. 8 inches. The tallest tree measured by Dr. TenBroeck is in Central Park and stands 51 ft. 6 inches high with a trunk 14 ft. 3 inches at breast height. One of Dr. Councilman's pictures shows a tree larger than any of the above, but, unfortunately, no measurements are given. These ancient trees have enormous, massive, contorted branches spreading horizontally and forming open, flattened, rounded crowns. The trunks are clothed with fibrous fissured bark, gray without and red-brown within, and some of them are richly embellished with large and small

burls of fantastic shapes. Nothing could be more unlike the tree we know in western gardens than these old monarchs beneath which Marco Polo may well have rested and found shade during his sojourn at the Khan's court.

LIGNEOUS PLANTS COLLECTED IN NEW CALEDONIA
BY C. T. WHITE IN 1923

INTRODUCTORY NOTE

C. T. WHITE

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EARLY in 1923 Prof. Sargent wrote and asked me if I would undertake to make a brief trip to New Caledonia to obtain specimens of the ligneous plants of the island for the herbarium of the Arnold Arboretum. The whole of October and the early part of November were consequently spent in the field.

On arrival at Noumea I was fortunate in getting in touch with Monsieur I. Franc, a local schoolmaster, who has spent a considerable part of his vacational periods in collecting plants in various parts of New Caledonia, particularly in the neighbourhood of Prony. Subsequently, I was able to obtain from him a very large number of duplicates from his herbarium.

The flora of New Caledonia possesses great interest for the Australian botanist owing to its closest affinities being undoubtedly with those of eastern Australia, particularly Queensland and northern New South Wales. This affinity is represented by at least one family—the Balanopsidaceae—and several genera, e.g. *Argophyllum* (Saxifragaceae), *Callistemon* (Myrtaceae), *Callitris* (Pinaceae), *Duboisia* (Solanaceae), *Fontainea* (Euphorbiaceae), *Halfordia* (Rutaceae) and *Kermadecia* (Proteaceae) common to the two countries and found nowhere else. Some comparatively large genera common to the two countries though not absolutely confined to them, find their greatest development in them. A case in point is *Hibbertia* (Dilleniaceae) of which 110 species are known, 89 are found in Australia and 19 in New Caledonia leaving only 2 species, these last being found in Madagascar. A striking feature of the New Caledonian species is their aborescent habit, most of the Australian forms being dwarf undershrubs little more than herbaceous.

Among the capsular-fruited Myrtaceae are several genera common in the respective flora of Australia and New Caledonia and finding a more limited development outside, e.g. *Baeckea*, *Melaleuca*, *Tristania* and *Xanthostemon*.

The Proteaceae are well represented in both countries, and genera common to both are *Grevillea* and *Stenocarpus*. The former genus contains about 180 species, one of which occurs in New Guinea, 14 in New Caledonia and the remainder in Australia. Two of the Australian species also extend to New Guinea. *Stenocarpus*, on the other hand, finds its

greatest development in New Caledonia. It contains 24 species, one of which is found in New Guinea, 5 in Australia and the remaining 18 in New Caledonia. A marked difference between the Australian and New Caledonian species is that the latter are xerophytic in character and are prominent features of the scrubby serpentine flora; the former, on the other hand, are large timber trees, natives of the rain-forests of the coastal belt.

A feature of the flora of New Caledonia is the extraordinary development of the closely allied families Saxifragaceae and Cunoniaceae, particularly the latter. The members of both are outstanding plants of the dry scrubby serpentine belt. In Australia both families are fairly well developed, but with very few exceptions the species are all rain-forest mesophytic types.

A striking similarity of New Caledonia with eastern Australia is the great development of Casuarina in the flora—14 species in New Caledonia and 12 in eastern Australia. In both countries the trees are very distinctive features in the landscape, and one species (*Casuarina Cunninghamiana* Miq.) is a common tree along streams and rivers in both countries.

The general facies of the vegetation strongly reminds one of that of parts of coastal North Queensland. An outstanding difference, however, is the absence of Eucalyptus in the New Caledonian flora. The place of the Eucalypt, as an outstanding tree of the savannah forest, is taken by the tree known universally in New Caledonia as the Niaouli (*Melaleuca viridiflora* Gaertn.). This tree is very abundant in coastal Queensland and New South Wales, being known as the Paper-barked or Broad-leaved Tea Tree, and where its presence gives to large tracts of country the name of Tea Tree Swamps. In New Caledonia the tree shows great adaptability to different conditions, accommodating itself, on the one hand, to dry hill-sides, and on the other, to saline swamps along the margins and near the mouths of rivers.

A fairly common member of the Niaouli formation is *Acacia spirorbis* Labill. a phyllodineous species; like its congeners in Australia the trees are often attacked by a rust fungus (*Uromycladium* sp.) which forms large brown galls on the branches.

The Niaouli forest alternates with rich rain forest in much the same way as, in tropical and subtropical Australia, the Eucalyptus savannah alternates with heavy rain forest, the line of demarcation between the two being very sharp and in nowise gradual.

The Niaouli country is largely used as grazing land, when cleared it often becomes overrun with Lantana (*Lantana Camara* L.) and Guava (*Psidium Guajava* L.). These two plants also often overrun much of the pasture and farm lands in coastal Queensland.

This is not the place to enter in a general account of the vegetation of New Caledonia, as that has already been done by Schlechter¹ and by

¹ Die Vegetationsformationen von Neu-Caledonien, Bot. Jahrb. XXXIII. Beibl. LXXXIII. 67-74 (1903).—Pflanzengeographische Gliederung der Insel Neu-Caledonien. (Bot. Jahrb. XXXVI. 1-41 (1905).

Guillaumin,¹ but some of the more outstanding features might be mentioned. These are, firstly, the extraordinary large number of woody plants compared with herbaceous ones, the proportion being about 5 to 1; secondly, the very large number of endemic species, the degree of endemism, according to Guillaumin,² reaching 76.5% of the flora; and thirdly, the large number of endemic conifers and taxads in the island estimated by Compton³ at 31 well marked species, "an altogether exceptional number for so small an area as New Caledonia."

Some of the Conifers are being rapidly exploited as sources of commercial timber; particularly is this the case with the largest of the three New Caledonian species of Kauri (*Agathis lanceolata* Pancher) and the Sapin de Montagne (*Araucaria Balansae* Brong. & Gris). Both of these trees are being cut at a rapid rate and a big export trade being worked up, so that, in the absence of any policy of conservation, it is only a matter of a short time before most of the trees of a marketable size of the two species will be cut out.

In addition to the pines, the principal other timber cut is the Chêne Gomme (*Spermolepis gummiifera* Brong. & Gris) a hardwood that is not exported but is used locally for building purposes at Noumea and other towns and settlements.

As facilities at Brisbane did not allow me to undertake the identification of the material collected, a set of the Angiosperms was sent to Dr. A. Guillaumin of Paris, and to him my best thanks are due for his promptness in dealing with the collections and returning determinations. To Prof. R. H. Compton I owe thanks for much valuable advice as to localities to visit in the very short time at my disposal and the quickest methods of getting there. From M. I. Franc I received much valuable assistance and advice. To Mr. E. D. Griffiths, and to MM. Varin and Huet I was indebted for facilities to visit large timber areas being worked under their control.

GYMNOSPERMAE³

Enumerated by ERNEST H. WILSON

CYCADACEAE

Cycas Linn.

Cycas neo-caledonica Linden in Ill. Hort. xxviii. 32 (1881), name only.—Warburg in Monsunia, i. 180 (1900).—Safford in Bailey, Stand. Cycl. Hort. ii. 933 (1914).

Cycas circinalis Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 270 (1911).
—Not Linnaeus.

¹ "Essai de géographie botanique de la Nouvelle Calédonie" in F. Sarasin and J. Roux, Nova Caledonia, Bot. I. 256-293, map (1921).

² Jour. Linn. Soc. xlv. 421 (1922).

³ Including specimens collected by I. Franc and complete references to all the species and varieties known from the island.

Cycas revoluta Guillaumin, l.c.—Not Thunberg.

Cycas sp. Compton in Jour. Linn. Soc. XLV. 424 (1922).

I have seen no material of any Cycad from New Caledonia, but, since the vegetation in general is so largely endemic, there is no reason why *Cycas* should be any exception; I therefore favor referring the *Cycas* material to Linden's species although he gave it merely a name; the only description there is, is a brief one by Safford. *Cycas revoluta* Thunb. is now known to be endemic on the islands of the Liukiu Archipelago. *C. circinalis* Linn. is native of the Malabar coast of the Indian peninsula but just how widely it is distributed is unknown. I doubt, however, if the plants from Madagascar or the Malay Archipelago, which have been referred to it, really belong there. R. H. Compton (l.c.) favors *C. Rumphii* Miq. which is much more likely since this species is widely spread on the islands of Java, Borneo, the Philippines and elsewhere in Malaysia, yet the flora of New Caledonia is not closely related to the above regions. So until good and sufficient material of the New Caledonian Cycads is available it may well be regarded as an endemic species and kept under Linden's name.

TAXACEAE

Subfam. I. *PODOCARPEAE* Reichb.¹

Podocarpus L'Herit.

Sect. I. *DACRYCARPUS* Endl.

Podocarpus Vieillardii Parlatores in De Candolle, Prodr. XVI. pt. II. 521 (1868).—Brongniart & Gris in Bull. Soc. Bot. France, XVI. 325 (1869); in Ann. Sci. Nat. Paris, sér. 5, XIII. 341 (1871).—Pilger in Engler, Pflanzenr. IV.-5, 56, fig. 7 F (Taxac.) (1903).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, IX. 269 (1911); in Bull. Mus. Hist. Nat. Paris, XIX. 524 (1913).—Compton in Jour. Linn. Soc. XLV. 425 (1922).—Dallimore & Jackson, Handb. Conif. 58 (1923).

Podocarpus tenuifolia Parlatores in De Candolle, Prodr. XVI. pt. II. 521 (1868).—

Guillaumin in Ann. Mus. Col. Marseille, sér. 2, IX. 269 (1911).

Dacrydium elatum compactum Carrière, Traité Conif. ed. 2, 693 (1869).

Dacrydium elatum tenuifolium Carrière, l. c.

Near Dombéa, nos. 2112, 2285, October; tree about 13 m. tall, with spreading top, overhanging watercourses; not common.

Sect. II. *MICROCARPUS* Pilger

Podocarpus usta Brongniart & Gris in Ann. Sci. Nat. Hist. Paris, sér. 5, VI. 243 (1866); in Bull. Soc. Bot. France, XIII. 426 (1866).—Parlatores in De Candolle, Prodr. XVI. pt. II. 520 (1868).—Pilger in Engler, Pflanzenr. IV.-5, 58, fig. 8 (Taxac.) (1903).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, IX. 269 (1911); in Bull. Mus. Hist. Nat. Paris, XVIII. 100 (1912).—

¹ Polypodiopsis Muelléri Carrière, Traité, Conif. éd. 2, 710 (1867).—Bertrand in Ann. Sci. Nat. Hist. Paris, sér. 5, XX. 65, in a note (5) (1874).—Pilger in Bot. Jahrb. LIV. 37 (1916); in Engler & Prantl, Nat. Pflanzenfam. ed. 2, XIII. 245 (1926).—Hutchinson in Kew Bull. Misc. Inform. 1920, 372.

This obscure plant has been usually referred to the Podocarpeae, but Hutchinson, acting on a suggestion from Professor Lecomte, identifies it with *Bauprea Balansae* Brong. & Gris, a member of the Proteaceae.

Compton in Jour. Linn. Soc. XLV. 425 (1922).—Dallimore & Jackson, Handb. Conif. 58 (1923).

Dacrydium ustum Vieillard in Ann. Sci. Nat. Hist. Paris, sér. 4, xvi. 56 (1861).

—Carrière, Traité Conif. ed. 2, 697 (1867).

Sect. III. NAGEIA Endl.

Podocarpus minor Parlature in De Candolle, Prodr. xvi. pt. II. 509 (1868).—Brongniart & Gris in Bull. Soc. Bot. France, xvi. 326 (1869); in Ann. Sci. Nat. Hist. Paris, sér. 5, XIII. 342 (1871).—Sebert, Not. Bois Nouv. Caléd. 170 (1874).—Pilger in Engler, Pflanzenr. IV.-5, 62 (Taxac.) (1903); in Bot. Jahrb. LIV. 36 (1916).—Schlechter in Bot. Jahrb. XXXIX. 16 (1907).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, IX. 269 (1911); in Bull. Mus. Hist. Nat. Paris, XIX. 383 (1913); XXVIII. 108 (1922).—Compton in Jour. Linn. Soc. XLV. 425 (1922).—Dallimore & Jackson, Handb. Conif. 51 (1923).

Nageia minor Carrière, Traité Conif. ed. 2, 641 (1867).

Mt. Mou, alt. 1150 m., no. 2033, October; tree 13 m. tall with trunk 0.45 m. in diameter; bark dark gray. Rivière des Pirogues, no. 2261, October; shrub or small tree from 1.5 to 6 m. tall. Bay of Prony, Plaine des Lacs, I. Franc, no. 207 (ser. A), January, 1914.

Sect. IV. STACHYCARPUS Endl.

Podocarpus ferruginoides Compton in Jour. Linn. Soc. XLV. 424 (1922).—Dallimore & Jackson, Handb. Conif. 45 (1923).

I have seen no material of this species. It would appear that the New Caledonian specimen collected by M. T. Lecard and referred to *P. ferrugineus* D. Don by Pilger (in Engler, Pflanzenr. IV.-5, 67 [Taxac.] [1903]) belongs to Compton's species or to the undetermined species represented by C. T. White's no. 2120 enumerated below.

Podocarpus sp.

Baie des Pirogues, no. 2120, October 16; tree 40 ft. tall, rare, inland rain forest valleys.

The material consists of one seedling plant and two leafy branches, and of the New Caledonian species is most closely related to *P. ferruginoides* Compton. The leaves are green on both surfaces, lanceolate, from 1 to 2 cm. long and 0.3 to 0.5 cm. broad, acute, rounded or truncate at the base with the petiole clasping the stem; they are arranged in one plane and the branches have a frondose appearance. From the description and figure of *P. vitiensis* Seem. this New Caledonian plant would appear to be very similar to the Fijian species.

Sect. V. EUPODOCARPUS Endl.

Podocarpus novae-caledoniae Vieillard in Ann. Sci. Nat. Hist. Paris, sér. 4, xvi. 56 (1861).—Brongniart & Gris in Ann. Sci. Nat. Hist. Paris, sér. 5, VI. 242 (1866); in Bull. Soc. Bot. France, XIII. 425 (1866).—Parlature in De Candolle, Prodr. xvi. pt. II. 513 (1868).—Pilger in Engler, Pflanzenr. IV.-5, 76 (Taxac.) (1903).—Guillaumin in Ann. Mus. Col. Marseille,

sér. 2, ix. 269 (1911); in Bull. Mus. Hist. Nat. Paris, xviii. 100 (1912); xix. 523 (1913); xxv. 373 (1919); xxviii. 108 (1922).—Compton in Jour. Linn. Soc. LXV. 425 (1922).—Dallimore & Jackson, Handb. Conif. 53 (1923).

Podocarpus rivularis Pancher apud Brongniart & Gris in Ann. Sci. Nat. Hist. Paris, sér. 5, vi. 243 (1866).

Rivière des Pirogues, no. 2231, October 25; shrub 1–3 m. tall, fairly common. Bay of Prony, side of streams, *I. Franc*, no. 96 (ser. A), July, 1913.

Podocarpus novae-caledoniae var. *latifolia* Brongniart apud Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 269 (1911).

Podocarpus gnidioides Carrière, Traité Conif. ed. 2, 656 (1867).—Pilger in Engler, Pflanzenr. iv.–5, 82 (Taxac.) (1903); in Bot. Jahrb. LIV. 39 (1916).—Schlechter in Bot. Jahrb. xxxix. 16 (1907).—Guillaumin in Bull. Mus. Hist. Nat. Paris, xviii. 100 (1912).—Dallimore & Jackson, Handb. Conif. 46 (1923).

Podocarpus alpina var. *arborescens* Brongniart & Gris in Ann. Sci. Nat. Hist. Paris, sér. 5, vi. 242 (1866); in Bull. Soc. Bot. France, xiii. 425 (1866).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 269 (1911).

Podocarpus gnidioides var. *caespitosus* Carrière, Traité, Conif. éd. 2, 657 (1867).—Pilger in Engler, Pflanzenr. iv.–5, 84 (Taxac.) (1903).—Guillaumin in Bull. Mus. Hist. Nat. Paris, xviii. 100 (1912).—Compton in Jour. Linn. Soc. XLV. 426 (1922).—Dallimore & Jackson, Handb. Conif. 46 (1923).

Podocarpus alpina var. *γ. caespitosa* Brongniart & Gris in Ann. Sci. Nat. Hist. Paris, sér. 5, vi. 242 (1866); in Bull. Soc. Bot. France, xiii. 435 (1866).

Podocarpus caespitosus Pancher apud Brongniart & Gris in Ann. Sci. Nat. Hist. Paris, sér. 5, vi. 242 (1866), as a synonym.

Podocarpus gnidioides Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 269 (1911).—Not Carrière.

Podocarpus longefoliolatus Pilger in Engler, Pflanzenr. iv.–5, 79 (Taxac.) (1903).—Guillaumin in Bull. Mus. Hist. Nat. Paris, xviii. 100 (1912).—Compton in Jour. Linn. Soc. XLV. 426 (1922).

Podocarpus sp.

Baie des Pirogues, no. 2118, October; tree about 50 ft. high, not common, inland rain forest valleys. Mt. Mou, on summit, alt. 1160 m., no. 2037^a, October; tree about 50 ft. tall with trunk 6 ft. in girth, with light gray longitudinally furrowed bark, growing associated with *Araucaria Rulei* F. Muell.

This is a typical *Eupodocarp*, but unfortunately only leafy branches are present. These strongly resemble *P. nerifolia* D. Don in general appearance. The leaves are up to 16 cm. in length and from 1 to 1.5 cm. broad, obtuse and mucronulate or subacute with a distinct petiole and midrib prominent on both surfaces. It would appear to be the same as *R. H. Compton's* no. 1273 collected in Mt. Canala (see Jour. Linn. Soc. XLV. 426 [1922]).

Another undetermined species belonging to the Sect. *Eupodocarpus* is

Podocarpus sp. no. 271, *R. H. Compton* (in Jour. Linn. Soc. XLV. 426 [1922]).

Dacrydium Soland

Dacrydium taxoides Brongniart & Gris in Ann. Sci. Nat. Paris, sér. 5, VI. 245 (1866); in Bull. Soc. Bot. France, XIII. 427 (1866); in Nouv. Arch. Mus. Paris, IV. 7, t. 3 (1868).—Parlatore in De Candolle, Prodr. XVI. pt. II. 492 (1868).—Pilger in Engler, Pflanzenr. IV.—5, 45 (Taxac.) (1903).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, IX. 270 (1911).—Compton in Jour. Linn. Soc. XLV. 427 (1922).—Dallimore & Jackson, Handb. Conif. 31 (1923).

Podocarpus taxodioides Carrière, Traité Conif. éd. 2, 657 (1867).

Dacrydium araucarioides Brongniart & Gris in Ann. Sci. Nat. Hist. Paris, sér. 5, VI. 244 (1866); in Bull. Soc. Bot. France, XIII. (1866); in Nouv. Arch. Mus. Paris, IV. 5, t. 2 (1868).—Parlatore in De Candolle Prodr. XVI. pt. II. 496 (1868).—Pilger in Engler, Pflanzenr. IV.—5, 48, fig. 5 F (Taxac.) (1903); in Bot. Jahrb. LIV. 36 (1916).—Schlechter in Bot. Jahrb. XXXIX. 15 (1907).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, IX. 270 (1911); in Bull. Mus. Hist. Nat. Paris, XXVIII. 108 (1922).—Schinz & Guillaumin in Sarasin & Roux, Nov. Caled. Bot. I. 114 (1920).—Compton in Jour. Linn. Soc. XLV. 427 (1922).—Dallimore & Jackson, Handb. Conif. 26 (1923).

Dacrydium arthrotaxoides Carrière, Traité Conif. éd. 2, 697 (1867).

Podocarpus araucarioides Brongniart & Gris apud Pancher in Sebert, Not. Bois N. Caléd. 171 (1874).

Rivière des Pirogues, no. 2122, October 16; small tree 6 m. tall, with spreading candelabrum-form crown; abundant on dry hills of serpentine rock. Bay of Prony, Plaine des Lacs, *I. Franc*, no. 764 (series A), September, 1913.

Dacrydium balansae Brongniart & Gris in Bull. Soc. Bot. France, XVI. 328 (1869); in Ann. Sci. Nat. Hist. Paris, sér. 5, XIII. 344 (1871).—Pilger in Engler, Pflanzenr. IV.—5, 53 fig. 5 D (Taxac.) (1903).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, IX. 270 (1911).—Schinz & Guillaumin in Sarasin & Roux, Nov. Caled. Bot. I. 115, fig. (1920).—Compton in Jour. Linn. Soc. XLV. 427 (1922).—Dallimore & Jackson, Handb. Conif. 26 (1923).

Dacrydium lycopodioides Brongniart & Gris in Bull. Soc. Bot. France, XVI. 329 (1869); in Ann. Sci. Nat. Hist. Paris, sér. 5, XIII. 345 (1871).—Pilger in Engler, Pflanzenr. IV.—5, 52 (Taxac.) (1903).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, IX. 270 (1911).—Compton in Jour. Linn. Soc. XLV. 427 (1922).—Dallimore & Jackson, Handb. Conif. 31 (1923).

Mont Mou, no. 2001, October; tree 13 m. tall, girth 2 m., with spreading crown and dark gray bark. Rivière des Pirogues, no. 2238, October 25, 1923; tree 16 m. tall, girth 2 m.

Acropyle Pilger

Acropyle pancheri Pilger in Engler, Pflanzenr. IV.—5, 117 fig. 24 (1903); in Bot. Jahrb. LIV. 43 (1916).—Guillaumin in Bull. Mus. Hist.

Nat. Paris, xxv. 373 (1919).—Compton in Jour. Linn. Soc. XLV. 426 (1922).—Dallimore & Jackson, Handb. Conif. 19 (1923).

Dacrydium Pancheri Brongniart & Gris in Bull. Soc. Bot. France, xvi. 330 (1869); in Ann. Sci. Nat. Hist. Paris, sér. 5, xiii. 346 (1871).

Podocarpus pectinata Pancher apud Brongniart & Gris in Bull. Soc. Bot. France, xvi. 330 (1869).—Masters in Gard. Chron. sér. 3, xi. 113 (1892).—

Kew Bull. Misc. Inform. 1892, 105.—Hooker f. in Bot. Mag. cxxviii. t. 7854 (1902).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 269 (1911).

Mont Mou, alt. 1200 m., *I. Franc*, no. 170, January 3, 1917.

Subfam. II. TAXEAE Reichb.

Austrotaxus Compton

Austrotaxus spicata Compton in Jour. Linn. Soc. LXV. 427, t. 26 (1922).—Dallimore & Jackson, Handb. Conif. 20 (1923).

Mt. Canala, *R. H. Compton*; fragment of type.

PINACEAE

Subfam. I. ARAUCARIEAE Reichb.

Agathis Salisb.

Agathis ovata Warburg in Monsunia, i. 186 (1900).—Schlechter in Bot. Jahrb. xxxix. 16 (1907).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 267 (1911); in Bull. Mus. Nat. Hist. Paris, xviii. 100 (1912); xxviii. 108 (1922).—Compton in Jour. Linn. Soc. XLV. 431 (1922).—Dallimore & Jackson, Handb. Conif. 146 (1923).

Dammara ovata Moore apud Gordon, Pinet. Suppl. 28 (1862).—Parlatore in De Candolle, Prodr. xvi. pt. ii. 375 (1868).

Dombea, mountains about 1000 m. altitude, no. 2284, October; tree about 30 ft. high with spreading crown, bark persistent, rather rough unlike that of other species of *Agathis*. Baie des Pirogues, inland toward Plaine des Lacs, on serpentine rocks, no. 2109, October 16; tree 20 ft. tall, only one seen. Rivière des Pirogues, no. 2272, October; tree about 40 ft. tall with dense spreading crown and trunk $4\frac{1}{2}$ ft. in girth; only one tree seen in a journey of 16 miles. Bay of Prony, *I. Franc*, no. 156 (ser. A), October, 1913.

Agathis lanceolata Warburg in Monsunia, i. 186 (1900).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 267 (1911).—Compton in Jour. Linn. Soc. XLV. 431 (1922).—Dallimore & Jackson, Handb. Conif. 144 (1923).

Dammara lanceolata Pancher in Sebert, Not. Bois Nouv. Caléd. 169 (1874)

Mont Mou, in rain forest at base, no. 2064, October 5; tree 100 ft. tall, girth 9 ft., bark scaling off in thick flakes of irregular size. Baie des Pirogues, inland in rich forest valleys, no. 2116, October.

Mr. White states that this is the most important soft-wood tree in New Caledonia.

Agathis Moorei Masters in Jour. Hort. Soc. Lond. xiv. 197 (1892).—Warburg in Monsunia, i. 186 (1900).—Seward & Ford in Trans. Roy. Soc. Lond. cxcviii. 315, figs. 1, a; 4, c-d; 24, a-d (1906).—Guillaumin in Ann.

Mus. Col. Marseille, sér. 2, ix. 267 (1911).—Compton in Jour. Linn. Soc. XLV. 431 (1922).—Dallimore & Jackson, Handb. Conif. 146 (1923).

Dammara Moorei Lindley in Jour. Hort. Soc. Lond. vi. 271 (1851).—Carrière, Traité Conif. 429 (1855).—Gordon, Pinet. 78 (1858).—Vieillard in Ann. Sci. Nat. Paris, sér. 4, xvi. 56 (1861).—Henkel & Hochstetter, Syn. Nadelh. 216 (1865).—Parlatore in De Candolle, Prodr. xvi. pt. II. 376 (1868).

Agathis spinulosa Warburg in Monsunia, I. 186 (1900).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 268 (1911).

Dammara spinulosa C. Moore in Cat. Pl. Gov. Bot. Gard. Sydney, 1895, 89.

This is an obscure plant, and so, too, is that named *Dammara pumila* C. Moore (in Cat. Pl. Gov. Bot. Gard. Sydney, 1895, 89). Both are probably referable to one or other of the foregoing species of New Caledonian *Agathis*.

Agathis hypoleuca Warburg in Monsunia, I. 186 (1900).—Seward & Ford in Trans. Roy. Soc. Lond. CXCVIII. 316 (1906).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 267 (1911).

Dammara hypoleuca Moore apud Henkel & Hochstetter, Syn. Nadelh. 217 (1865).

A sixth species of *Agathis* from New Caledonia is listed by Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 267 (1911) citing localities and collectors under the name of *A. (D. macrophylla)* Lindl.). This is probably referable to one or other of the five species enumerated above. It is not the *Dammara macrophylla* Lindl. (in Jour. Hort. Soc. Lond. vi. 271 [1851]) which is a native of the Queen Charlotte Islands where it was collected on the Island of Vanicoro by C. Moore in 1850.

Araucaria Juss.

Sect. I. COLUMBEA Endl.

Araucaria Rulei F. Mueller apud Lindley in Gard. Chron. 1861, 868, in part, exclud. figs.—Gordon, Pinet. suppl. 15 (1862).—Henkel & Hochstetter, Syn. Nadelh. 7 (1865).—Jackson in Intellectual Obser. VII. 428 (1865).—Parlatore in De Candolle, Prodr. xvi. pt. II. 371 (1868).—Brongniart & Gris in Ann. Sci. Nat. Hist. Paris, sér. 5, XIII. 360 (1871); in Nouv. Arch. Mus. Paris, VII. 216, t. 16, figs. 4-7 (1871); in Bull. Soc. Bot. France, XVIII. 137 (1871).—Pancher in Sebert, Not. Bois Nouv. Caléd. 168 (1874).—C. Raffill in Gard. Chron. sér. 3, XL. 353 (1906).—Seward & Ford, in Trans. Roy. Soc. Lond. CXCVIII. 328, figs. 13, a; 20, b-d, f-h; 22; 25, a-c; 26, a (1906).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 268 (1911).—Bailey, Stand. Cycl. Hort. I. 346, fig. 304 (1914).—Schinz & Guillaumin in Sarasin & Roux, Nov. Caled. I. 114, t. 5, fig. 2 (1920).—Maiden in N. S. Wales Bot. Gard. Gov. Domains Rep. 1920, t. 7 (1922).—Compton in Jour. Linn. Soc. XLV. 429 (1922).—Kotze in Union S. Afr. For. Dept. Bull. no. VI. 11, 18, t. 11, fig. 1 (1923).—Dallimore & Jackson, Handb. Conif. 160 (1923).

Araucaria intermedia Vieillard in Ann. Sci. Nat. Hist. Paris, sér. 4, xvi. 54 (1861).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 268 (1911).

Eutacta Rulei Verlot in Rev. Hort. 1866, 279, fig. 1.—Carrière in Rev. Hort. 1866, 392, fig. 2.

Eutacta Rulei polymorpha Carrière in Rev. Hort. 1866, 350, fig. 41; *Traité Conif.* éd. 2, 606 (1867).

Eutacta Pancherii Carrière, *Traité Conif.* éd. 2, 615 (1867).

Eutacta Rulei compacta Carrière in Rev. Hort. 1866, 392, fig. 1; *Traité Conif.* éd. 2, 606 (1867).

Eutacta Muelleri microphylla Carrière in Rev. Hort. 1866, 392, fig. 4; *Traité Conif.* éd. 2, 607 (1867).

Araucaria Rulei β . *patens* Barsali in Atti Soc. Tosc. Sci. Nat. xxv. 162 (1909).—Fedde, Rep. Spec. Nov. ix. 140 (1911).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 268 (1911).

Araucaria Rulei var. *polymorpha* Bailey Stand. Cycl. Hort. i. 346 (1914).

Araucaria Rulei var. *compacta* Bailey, l. c.

Mt. Mou, alt. 1150 m., no. 2021, October; the principal tree in rich rain forest on the summit of the mountain.

Araucaria Rulei var. *Goldieana* Masters in Jour. Hort. Soc. Lond. XIV. 198 (1892).—Bailey, Stand. Cycl. Hort. i. 346 (1914).—Rehder in Bailey, Cult. Evergreens, 244 (1923).

Araucaria Van Geertii Hort. apud van Geert in Gard. Chron. n. s. v. 603 (1876), name only.

Araucaria Goldieana Hort. apud T. Moore in Flor. & Pomol. 1877, 39, fig. Nicholson, Dict. Gard. i. 106 (1887).

Araucaria excelsa Goldieana C. Raffill in Gard. Chron. sér. 3, xl. 353, fig. 140 (1906).

Araucaria Rulei var. *pendula* Barsali in Atti Soc. Tosc. Sci. Nat. xxv. 162 (1909).—Fedde, Rep. Spec. Nov. ix. 140 (1911).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 268 (1911).

Araucaria Muelleri Brongniart & Gris in Ann. Sci. Nat. Hist. Paris, sér. 5, xiii. 362 (1871); in Nouv. Arch. Mus. Paris, vii. 219, tt. 15, 16, figs. 1–3 (1871); in Bull. Soc. Bot. France, xviii. 139 (1871).—Rodigas in Illust. Hort. xxix. 449, t. 73 (1882).—Seward & Ford in Trans. Roy. Soc. Lond. cxcviii. 329, fig. 11, d–e (1906).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 268 (1911).—Compton in Jour. Linn. Soc. xlv. 430 (1922).—Dallimore & Jackson, Handb. Conif. 160 (1923).

Araucaria Rulei Lindley in Gard. Chron. 1861, 868, figs., in part.

Eutacta Muelleri Carrière in Rev. Hort. 1866, 392, fig. 3; *Traité Conif.* éd. 2, 607 (1867).

Araucaria Rulei grandifolia Mueller apud Carrière in Rev. Hort. 1866, 39, as a synonym.

Araucaria montana Brongniart & Gris in Ann. Sci. Nat. Hist. Paris, sér. 5, xiii. 358 (1871); in Nouv. Arch. Mus. Paris, vii. 215, t. 14, figs. 1–3 (1871); in Bull. Soc. Bot. France, xviii. 136 (1871).—Seward & Ford in Trans. Roy. Soc. Lond. cxcviii. 330, fig. 11, f (1906).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 268 (1911).—Compton in Jour. Linn. Soc. xlv. 429 (1922).

Sect. II. EUTACTA Parl.

Araucaria columnaris Hooker in Bot. Mag. lxxviii. t. 4635 (1852).—Van Houtte in Fl. des Serr. vii. 243, tt. 733–34 (1852).—Jackson in Intellectual Obser. vii. 417 (1865).—Schinz & Guillaumin in Sarasin & Roux, Nov. Caled. i. 113, t. 5, fig. 1 (1920).—Guillaumin in Bull. Mus. Nat. Hist. Paris, xxviii. 108 (1922).

Cupressus columnaris Forster, Florul. Ins. Austr. Prodr. 67 (1786), excluding the Norfolk Island plant.

Araucaria excelsa Lambert, Descr. Gen. Pin. ed. 2, 81, t. 47 fig. a (1828), as to the New Caledonian plant.—Not R. Brown.

Araucaria Cookii R. Brown apud D. Don in Trans. Linn. Soc. xviii. 164 (1839).

—Endlicher, Syn. Conif. 188 (1847).—Lindley in Jour. Hort. Soc. Lond. vi. 272, 267, fig. d (1851).—Paxton, Flow. Gard. ii. 132 (1851–52); iii. 77, fig. (1852–53).—Lemaire in Jard. Fleur. ii. misc. 72, fig. (1852).—Carrière, Traité Conif. 421 (1855).—Gordon, Pinet. 27 (1858).—Vicillard in Ann. Sci. Nat. Paris, sér. 4, xvi. 55 (1861).—Henkel & Hochstetter, Syn. Nadelh. 12 (1865).—Parlatore in De Candolle, Prodr. xvi. pt. ii, 373 (1868).—Brongniart & Gris in Ann. Sci. Nat. Hist. Paris, sér. 5, xiii. 352 (1871); in Nouv. Arch. Mus. Paris, vii. 208, t. 14, figs. 4–6 (1871); in Bull. Soc. Bot. France, xviii. 131 (1871).—Pancher in Sebert, Not. Bois Nouv. Caléd. 166 (1874).—R. Abbay in Gard. Chron. n. s. vii. 86, figs. 13, 14 (1877).—Veitch, Man. Conif. 195 (1881).—Gard. Chron. sér. 3, iii. 774, figs. 104, 106 (1888); xxx. 387, figs. 116, 117 (1901).—Seward & Ford in Trans. Roy. Soc. Lond. cxcviii. 326, figs. 11, a–c, 12, 15, 24, g (1906).—C. Raffill in Gard. Chron. ser. 3, xl. 352, fig. 139 (1906).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 268 (1911).—Bailey, Stand. Cycl. Hort. i. 346 (1914).—Maiden, N. S. Wales Bot. Gard. Gov. Domains Rep. 1920, t. 7 (1922).—Compton in Jour. Linn. Soc. xlv. 429 (1922).—Kotze in Union S. Afr. For. Dept. Bull. no. VI. 13, 20, tt. 9, 10, 11, fig. 2 (1923).—Rehder in Bailey, Cult. Evergreens, 244 (1923).—Dallimore & Jackson, Handb. Conif. 154 (1923).

Araucaria subulata Vicillard in Ann. Sci. Nat. Hist. Paris, sér. 4, xvi. 55 (1861).—Seward & Ford in Trans. Roy. Soc. Lond. cxcviii. 330 (1906).

Eutacta Cookii Carrière, Traité Conif. ed. 2, 612 (1867).

Araucaria Cookii gracilis Carrière, l. c. 613.

Eutacta Cookii ovalifolia Carrière, l. c.

Eutacta Cookii viridis Carrière, l. c.

Eutacta subulata Carrière, l. c. 614.

Eutacta minor Carrière, l. c.

Eutacta humilis Carrière, l. c. 616.

Araucaria Cookii var. *Raoulei* C. Moore in Cat. Pl. Bot. Gard. Sydney, 88 (1895).

Araucaria Cookii var. *rigida* C. Moore, l. c.

Araucaria Raouli Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 268 (1911).

Baie des Pirogues, no. 2205, October; trees up to 100 ft. high, forming small colonies on the coast and ascending gullies among scrub between the hills of serpentine rock.

Bay of Prony, *I. Franc*, no. 1604 (ser. A). Noumea, cultivated, no. 2290, November 4. Noumea, Hort. *I. Franc*, no. 2129, October. Dombéa, Hort. *M. Huet*, no. 2166, October.

Araucaria columnaris f. *luxurians* Wilson, comb. nov.

Araucaria Cookii var. *luxurians* Brongniart & Gris in Ann. Sci. Nat. Paris, sér. 5, xiii. 354 (1871).—Seward & Ford in Trans. Roy. Soc. Lond. cxcviii. 327, fig. 11, a (1906).—Dallimore & Jackson, Handb. Conif. 154 (1923).

Araucaria columnaris f. *pendula* Wilson, comb. nov.

Araucaria Cookii var. *pendula* C. Moore in Cat. Pl. Bot. Gard. Sydney, 88 (1895), name only.

Araucaria Balansae Brongniart & Gris in Ann. Sci. Nat. Hist. Paris, sér. 5, xiii. 351 (1871); in Nouv. Arch. Mus. Paris, vii. 206, t. 13 (1871); in Bull. Soc. Bot. France, xviii. 130 (1871).—André in Illust. Hort. xxii. 26, t. 197, fig. (1875).—C. Raffill in Gard. Chron. ser. 3, xl. 352 (1906).—Seward & Ford in Trans. Roy. Soc. Lond. cxcviii. 329, fig. 20, i (1906).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 268 (1911).—Bailey,

Stand. Cycl. Hort. i. 346 (1914).—Compton in Jour. Linn. Soc. XLV. 429 (1922).—Rehder in Bailey, Cult. Evergreens, 244 (1923).—Dallimore & Jackson, Handb. Conif. 151 (1923).

Araucaria Rulei var. *elegans* Veitch, Man. Conif. 197 (1881).—Nicholson, Dict. Gard. i. 106 (1887).

Araucaria elegans C. Moore in Cat. Pl. Bot. Gard. Sydney, 88 (1895).—Bailey, Stand. Cycl. Hort. i. 346 (1914).

Baie des Pirogues inland, no. 2121, October 16; tree over 100 ft. tall, trunk 4 ft. diam. in rain forest valleys.

Mr. White observes that this furnishes splendid soft-wood timber and is much exploited at the present time, ranking next to *Agathis lanceolata* Warb. as the most important soft-wood tree in New Caledonia.

Callitris sulcata Schlechter in Bot. Jahrb. xxxix. 16 (1907).—Compton in Jour. Linn. Soc. XLV. 431 (1922).

Frenela sulcata Parlatore in Enum. Sem. Hort. Bot. Florence, 1862, 23; in De Candolle, Prodr. xvi. pt. II. 446 (1868).

Frenela subumbellata Parlatore in De Candolle, Prodr. xvi. pt. II. 447 (1868).

Frenela Balansae Brongniart & Gris in Ann. Sci. Nat. Paris, sér. 5, xiii. 348 (1871).

Callitris Balansae Schlechter in Bot. Jahrb. xxxix. 16 (1907).—Guillaumin in Ann. Mus. Col. Marseille, sér. 2, ix. 268 (1911).

Callitris sulcata var. *alpina* Compton in Jour. Linn. Soc. XLV. 432 (1922).

Callitropsis Compton

Callitropsis araucarioides Compton in Jour. Linn. Soc. XLV. 432 t. 27 (1922).

Bay of Prony, I. Franc.

Libocedrus Endl.

Libocedrus austrocaledonicus Brongniart & Gris in Ann. Sci. Nat. Paris, sér. 5, xiii. 349 (1871); in Bull. Soc. Bot. France, xviii. 140 (1871).—Guillaumin in Ann. Mus. Col. Marseilles, sér. 2, ix. 269 (1911).—Compton in Jour. Linn. Soc. XLV. 434 (1922).—Dallimore & Jackson, Handb. Conif. 301 (1923).

Libocedrus neocaledonicus Schlechter in Bot. Jahrb. xxxix. 16 (1907).

ANGIOSPERMAE

Determined by A. GUILLAUMIN Dr. ès Sc.

Muséum d'histoire naturelle, Paris

GRAMINEAE

Greslania circinata Bal.

Inland from Baie des Pirogues, in rather dry stunted forest associated with Melaleuca, Hibbertia, etc., no. 2119; bamboo 3 m. tall.

LILIACEAE

Cordyline neo-caledonica Linden (*Dracaena neo-caledonica* Hort.; *Cordyline cannaefolia* Schltr.).

Baie des Pirogues, no. 2183; shrub mostly about 1-1.25 m.; flowers white, suffused or streaked with lavender.

FLAGELLARIACEAE

Flagellaria indica L.

Baie des Pirogues, no. 2199; climber, climbing over trees everywhere, very common along the river banks.

Joinvillea elegans Brong. & Gris (*Flagellaria elegans* Seem.; *F. plicata* Hook f.).

Rivière des Pirogues (also seen on Mont Mou), very abundant, no. 2257; a bamboo-like plant 4-5 m. high.

CASUARINACEAE

Casuarina Cunninghamiana Miq.

In rather dry forests, base of Mont Mou, very abundant, no. 2046; tree attaining more than 30 m., the trunk with a diam. of 60 cm., bark rather rough; local name "Bois de fer." Dombea, along watercourses, no. 2160; tree of 20 m.; flowers apparently dioecious. Baie des Pirogues, on serpentine hills, no. 2178; tree 7 m. or more. Rivière des Pirogues, along the river associated with *C. equisetifolia* var. *incana*, no. 2276; tree 13 m.

Casuarina Deplancheana Miq. var. *crassidens* J. Poiss.

Rivière des Pirogues, no. 2230; a conifer-like tree 20 m. or more; branches erect.

Casuarina equisetifolia Forst. var. *incana* J. Poiss.

Baie des Pirogues, along sandy sea and river shores ascending here and there to the tops of serpentine hills, no. 2203; tree about 7 m., with drooping branches.

Casuarina nodiflora Forst.

Rivière des Pirogues, no. 2240; tree 20 m. high or more, with a trunk diameter of 60 cm., branchlets drooping.

Casuarina Poissoniana Schltr. (*C. Deplancheana* Miq. var. *debilis* J. Poiss.)

In rather dry forests, base of Mont Mou, also stunted trees on exposed hillsides, no. 2047; tree 13 m. tall, with a spreading top; local name "Bois de fer de montagne."

CHLORANTHACEAE

Ascarina rubricaulis Solms.

Mont Mou, no. 2000; small tree 5 m.; branchlets dark red; leaves yellowish-green above, pale almost white beneath; fruits small red.

ULMACEAE

Trema Vieillardii Schltr. (*Sponia Vieillardii* Planch.; *Celtis orientalis* Jeanneney, nomen).

Edge of rain forests, base of Mont Mou, no. 2073; tree 7 m., with slender trunk and spreading top.

MORACEAE

Ficus austro-caledonica Bur. var. *subattenuata* Bur.

Rain forests, base of Mont Mou, no. 2039; small tree about 10 m.; receptacles (only seen green) rather tuberculate, 1.8 cm. diam. Rain forests, base of Mont Mou, no. 2063; tree 12 m.

***Ficus edulis* Bur. var. *cordata* Bur.**

Rain forests, base of Mont Mou, no. 2097; tree 12 m., spreading top, receptacles large, hairy, 4.5 cm. diam.

***Ficus edulis* Bur. var. *ovata* Bur.**

Baie des Pirogues, in small coastal scrub, no. 2283; tree 12 m., spreading top; receptacles large, red, axillary, 5 cm. diam.

***Ficus philippinensis* Miq.**

Rain forests, base of Mont Mou, no. 2087; tree.

***Ficus stenocarpa* F. Muell. (*F. proteus* Bur.).**

Rain forests, base of Mont Mou, no. 2078; tree of 7 m. (but probably growing much larger), does not run with a milky sap when cut; receptacle very dark purple, Dombea, no. 2152. (This fig is common in the rain forests of coastal Queensland.—C.T.W.)

***Ficus Webbia* Miq. var. *cordata* Bur.**

Rain forests, base of Mont Mou, no. 2016; slender tree 7 m.; receptacles white marked with small dark dots.

***Sparattosyce dioica* Bur.**

Rivière des Pirogues, no. 2235; tree 18 m. with a densely foliated top; exuding milky sap when cut.

PROTEACEAE

***Grevillea Gillivrayi* Hook.**

Baie des Pirogues, no. 2198; slender tree, about 7 m., rather straggly growth; flowers white, usually tinged with pink; racemes not secund.

***Grevillea heterochroma* Brong. & Gris.**

Mont Mou, mostly in open exposed scrubby situations, no. 2008; in the open a dwarfed tree of spreading habit about 2.45 m. high, in more sheltered situations attaining 10 m.; flowers cream-colored, in secund racemes.

***Grevillea macrostachys* Brong. & Gris.**

Baie des Pirogues, common everywhere on the serpentine hills, no. 2181; tree of spreading habit, averaging about 5 m. but higher in more sheltered situations; flowers white.

***Stenocarpus trinervis* Guillaumin (*Lomatia trinervis* Montr.; *Stenocarpus laurinus* Brong. & Gris.; *S. laurifolius* Panch. & Seb.).**

Rivière des Pirogues, no. 2269; tree 13 m.

***Stenocarpus umbellatus* Schltr. (*S. Forsteri* R. Br.).**

Inland from Baie des Pirogues, no. 2125; tree 5 m.; flowers very pale yellow.

***Knightia Deplanchei* Vieill. ex Brong. & Gris.**

Rivière des Pirogues no. 2265; small tree 5 m.; spreading habit.

SANTALACEAE

***Exocarpus neo-caledonicus* Schltr. & Pilg.**

Inland from Baie des Pirogues, no. 2105, shrub 1.25 m.

***Exocarpus phyllanthoides* Endl. (*E. dilatatus* S. Moore).**

Summit of Mont Mou, no. 2022; shrub 1.75 m.; flowers small, yellow, in short spikes in axils of phylloclades.

LAURACEAE

Cryptocarya lanceolata Guillaumin (*Beilschmiedia lanceolata* Panch. & Seb.).

Rain forests, base of Mont Mou, no. 2172; tree 13 m., very spreading habit.

SAXIFRAGACEAE

Argophyllum montanum Schltr. (*A. Schlechterianum* Bonati & Petitm.).

Baie des Pirogues, common on the serpentine hills, no. 2185; shrub 1-1.5 m. high; leaves glossy above, dull and paler beneath; axes of panicle, pedicels and calyces covered with a close white tomentum; corolla yellow.

Dedea media Baill.

Mont Mou, on open exposed scrubby hills, no. 2010; shrub, flowers white, in axillary racemes.

Strasburgeria calliantha Baill.

Rain forests, summit of Mont Mou, no. 2026, coll. by Garigou; small tree 7 m. tall.

PITTOSPORACEAE

Pittosporum mouanum Guillaumin, n. sp.

Frutex 4 m. altus, ramis primum lanuginosis, deinde glabris, cortice cinereo desquamante; foliis sub-verticillatim approximatis, oblanceolatis (10-12 : 2.5 cm.), primum sparse lanuginosis, deinde glabris, interdum margine profunde et irregulariter incis, apice acutis, basi in petiolum 1.5 cm. longum sensim attenuatis, costa supra impressa, subtus prominula, nervis immersis, fere inconspicuis; floribus rubro-brunneo-viridibus, in axillis foliorum nondum omnino evolutorum pendulis; pedicellis 2-3 mm. longis, fulvo-lanuginosis; sepalis 5.5 mm. longis, linearibus, concavis, fere glaberrimis; petalis 5, elliptico-linearibus (6 : 2 mm.), apice rotundatis, medio coherentibus, intus extraque glabris, tubi parte lineari 4 mm. longa, limbi 2 mm. longa; staminibus 10, petalorum 4/5 aequantibus, filamentis basim versus paululo dilatatis, quam antheras longioribus, antheris lineari-oblongis, apice apiculatis; ovario ellipsoideo, fulvo-tomentoso, stylo cylindrico antheras paululo superante, stigmatibus leviter dilatato.

Summit of Mont Mou, no. 2024 (shrub about 4 m.; leaves green above, paler beneath; flowers insignificant, greenish, suffused with reddish brown).

Very near to *P. xanthanthum* Schltr. but the pedicels are shorter and the petals and filaments much shorter (the flower, however, is not fully opened), the style is not subulate at the end, but is terminated by a slightly dilated stigma. Besides the leaves are irregularly incised, but as I have already indicated,¹ it seems that in a number of New Caledonian species the leaves may be sometimes quite entire and sometimes dentate or incised.

Pittosporum Simsonii Montr. (*P. turbinatum* Brong. & Gris).

Rain forests, base of Mont Mou, no. 2048; tree about 13 m. high, with white, sweetly scented flowers.

¹ In Bull. Mus. Hist. Nat. Paris, xxv. 214 (1919)..

Pittosporum suberosum Panch. (*P. rhytidocarpum* Brong. & Gris, non A. Gray).

Noumea, in small coastal scrub, no. 2099; small tree, 5-7 m.

CUNONIACEAE

Spiraeanthemum ellipticum Vieill. ex Pampan.

Summit of Mont Mou, no. 2031; shrub 1.20 m. high.

Geissois hirsuta Brong. & Gris.

Dombea, no. 2158; tree 13 m., with spreading top; flower red.

Geissois pruinosa Brong. & Gris.

Rivière des Pirogues, no. 2211; slender tree about 7 m. high; flowers red, in racemes mostly on the older wood.

Geissois racemosa Labill.

Rain forest, base of Mont Mou, no. 2070; tree 20 m.; leaves turning red when old.

Geissois spec. aff. *G. montana* Brong. & Gris.

Rain forest, base of Mont Mou, no. 2072; small tree of 7 m., leaves turning red when old.

Cunonia macrophylla Brong. & Gris.

Mont Mou, on open exposed scrubby hillsides, no. 2015; shrub 2 m. high; young shoots protected between a pair of large green or red stipules; leaves thick and coriaceous, rhachis and petiole usually red, young leaves red.

Cunonia montana Schltr.

Summit of Mont Mou, abundant, no. 2025; shrub 1.50 m. high; young shoots red.

Cunonia purpurea Brong. & Gris.

Rivière des Pirogues; fairly abundant, no. 2224; shrub 2-3 m. high or more; flowers red.

Pancheria alaternoides Brong. & Gris.

Mont Mou, in open scrubby country, no. 2006; shrub 1.50 m.

Pancheria alaternoides Brong. & Gris var. *lanceolata* Pampan. (an *potius P. lanceolata* Vieill. ex Pampan?).

Baie des Pirogues, no. 2189; shrub 2 m.

Pancheria elegans Brong. & Gris.

Rivière des Pirogues, no. 2113; tree of 7 m., overhanging river-banks; leaves light green above, very pale green beneath; flowers white, in heads.

Pancheria Engleriana Schltr.

Mont Mou, about 1000 m. alt., no. 2030; shrub 1.20 m.; flowers in dense globular heads, the heads white or cream-colored owing to the protruding stamens.

Pancheria ferruginea Brong. & Gris.

Mont Mou, on open dry hills, no. 2002; shrub 1.20 m. high.

Pancheria hirsuta Vieill. ex Pampan. (*P. insignis* Schltr.).

Mont Mou, open exposed scrubby hillsides, no. 2011; shrub 1.20-1.50 m. high; leaves revolute, lustrous green above, dull beneath.

Pancheria obovata Brong. & Gris.

Rivière des Pirogues, no. 2201; shrub 1.50 m. high.

Pancheria Sebertii Guillaumin (*P. ternata* Panch. & Seb., non Brong. & Gris).

Rain forest, base of Mont Mou, no. 2092; small tree.

LEGUMINOSAE

Acacia Farnesiana Willd.

Noumea, everywhere along road sides, no. 2287; shrub 1-1.5 m. high.

Acacia spirorbis Labill. (*Albizzia auriculata* Fourn.).

Noumea, in small coastal scrub, no. 2133; small tree about 5 m. tall, with a spreading top; in some cases very badly attacked by *Uromycladium* (rust) galls. Baie des Pirogues, no. 2194; small tree 7 m. tall or less, with spreading top and of irregular growth.

Serianthes calycina Benth. (*S. myriadenia* Panch. & Seb., non Planch. ex Benth.).

Dombéa, no. 2041; tree about 13 m. tall, with a light colored bark and spreading top.

Leucaena glauca Benth.

Noumea, no. 2144; small tree of 4 m.; flowers white, in small heads.

Storckiella Pancheri Baill. (*S. laurina* Gdr.).

Rivière des Pirogues, abundant, no. 2277; a handsome tree of 13 m.; flowers yellow.

Mezoneurum Baudouini Guillaumin.

Païta, no. 2173; climbing to the tops of forest trees; flowers yellow.

LINACEAE

Hugonia Deplanchei Vieill. ex Guillaumin, nom. nov. (*Durandea Deplanchei* Stapf.).

Rivière des Pirogues, no. 2237; small tree of 5 m., of straggling growth; flowers yellow.

RUTACEAE

Evodia drupacea Labill.

Rivière des Pirogues, no. 2233; small tree about 10 m. tall.

Evodia pseudo-obtusifolia Guillaumin.

Rivière des Pirogues, no. 2190; small tree about 7 m. high; fruit with 4 fleshy 1-seeded pale yellow carpels.

Melicope lasioneura Baill. ex Guillaumin.

Rain forests, foot of Mont Mou, no. 2058; a small very slender tree 7 m. tall.

Eriostemon pallidum Schltr.

Rivière des Pirogues, no. 2226; dense growing spreading shrub of 1.50 m.; flowers white.

Myrtopsis novae-caledoniae Engl.

Baie des Pirogues, in small coastal gully scrub, no. 2207; small tree 7 m. tall, of rather irregular growth.

Flindersia Fournieri Panch. & Seb.

Rain forest valleys, inland from Baie des Pirogues, no. 2125; tree about 13 m. tall.

Acronychia laevis Forst. (*Huonia laevis* Montr., *Lawsonia Acronychia* Forst.)

Rain forests, base of Mont Mou, no. 2085; small tree. Baie des Pirogues, in a small scrub near the coast, no. 2268; small tree about 7 m. tall.

Muraya exotica DC. (*Limonia lucida* Forst.).

Noumea, in a small coastal scrub, no. 2136; shrub about 3 m. high, of upright growth; flowers white.

SIMARUBACEAE

Soulamea fraxinifolia Brong. & Gris.

Païta, no. 2171; small tree about 7 m. tall; flowers small, yellow. *Dombea*, no. 2164; small tree of 7 m.

Soulamea Pancheri Brong. & Gris.

Unfortunately, the field label belonging to this specimen was lost, but so far as I remember it was a small tree collected at Païta.—C.T.W.

Soulamea tomentosa Brong. & Gris.

In small coastal scrub, Noumea, no. 2135; small tree 7 m. tall, of spreading habit; flowers small, yellow.

BURSERACEAE

Canarium Whitei Guillaumin, n. sp.

Arbor mediocris, ramulis petiolisque primum rufo-tomentosis, foliis 7-8-jugis, interstitiis 3-4 cm. longis, foliolis rarius oppositis, longe petiolulatis (1.5-2.5 cm.), oblongis (8-13 : 4-4.5 cm.), basi obtusis, apice acuminatis, leviter coriaceis, nervis lateralibus 11-14, venis reticulatis in utraque pagina prominulis. Drupa obovoidea, compressa (4 : 3 : 2.5 cm.), endocarpio crassissimo, 2-loculari, uno loculo seminifero.

Rain forests, Rivière des Pirogues, no. 2255; a medium sized tree.

Although the specimen does not bear any flowers but only one fruit and that 2-celled, I do not hesitate to refer this species to the genus *Canarium* because of the presence of medullary fibro-vascular bundles both in the stem and in the leaf.¹ Among New Caledonian species it approaches most closely to *C. Balansae* Engl. but is easily distinguished by the greater number of leaflets (15-17 instead of 5-7) and the longer petioles.

MELIACEAE

Dysoxylum glomeratum Vieill. ex C.DC.

Rain forest, base of Mont Mou, no. 2091; tree about 13 m. tall, with spreading top.

Dysoxylum minutiflorum C. DC.? (*Epicharis minutiflora* Baill?)

Baie des Pirogues, no. 2274; tree about 13 m. tall.

Aglaia elaeagnoidea Benth. (*Nemeda elaeagnoidea* Juss.).

Small coastal scrub, Noumea, no. 2102; small tree 7 m. tall.

¹ Ann. Sci. Nat. Bot. sér. 9, x. 290 (1909.)

EUPHORBIACEAE

Glochidion diospyroides Schltr.

Rivière des Pirogues, in small coastal scrub, no. 2278; tree 10 m. tall.

Phyllanthus baladensis Baill. (*Glochidion baladense* Müll. Arg.; *Phyllanthus adenandrus* Müll. Arg.).

Rain forests Rivière des Pirogues, no. 2253; shrub 1.75 m. high; fruit yellow.

Phyllanthus Pancherianus Baill? (*Glochidion Pancherianum* Müll. Arg.).

Rather dry forest, base of Mont Mou, no. 2045; tree 5 m. tall; leaves dull opaque green above, purplish underneath; fruits red.

Resembles very closely Pancher's no. 106 (Mus. Neo-cal. no. 198), which bears in the herbarium of the Museum at Paris the name of *P. Pancherianus* and Vieillard's no. 1190 labelled *P. trigogynus* [sic] but differs distinctly from Pancher's no. 371 which is the type labelled in the handwriting of Baillon and from Schlechter's no. 1552 by the very hirsute branches, leaves and pedicels; it is true that the description of Baillon reads "undique pube tenuissima, fulvida conspersus."

Phyllanthus Vieillardii Baill.

Inland from Baie des Pirogues, along edge of rain forests, no. 2246^{bis}; small tree.

Bureavia carunculata Baill. (*Baloghia* ? *carunculata* Baill., *Codiaeum carunculatum* Müll. Arg.)

Rain forests, base of Mont Mou, no. 2086; small tree.

Baloghia lucida Endl. (*Codiaeum lucidum* Müll. Arg.).

Rain forests, base of Mont Mou, no. 2069; small tree of 10 m.

Fontainea Pancheri Heck. (*Codiaeum* ? *Pancheri* Müll. Arg.; *Baloghia Pancheri* Baill.).

Noumea, no. 2098; small tree of 7 m.; fruit a brilliant orange-red.

Bocquillonia sessiliflora Baill.

Baie des Pirogues, no. 2182; shrub 2.75 m. high, of upright growth, with few or often only a single stem; young shoots purple, flowers mostly on the old wood.

Bocquillonia spicata Baill.

Rain forests, Rivière des Pirogues, no. 2248; slender single stemmed tree 7 m. tall but often seen flowering and fruiting as a shrub of less than 2 m.; flowers red, mostly on the old wood but also in the leaf-axils.

Cleidion Vieillardii Baill. (*Macaranga Vieillardii* Müll. Arg., *C. tenuispica* Schltr.)

Rain forests, Rivière des Pirogues, no. 2234. Shrub about 2.75 m.; monoecious.

Macaranga alchorneoides Pax & Lingelsh.

Rivière des Pirogues, in heavy rain forests, no. 2246; tree 12 m. tall.

Acalypha neo-caledonica Müll. Arg.

Dombea, no. 2151; shrub 2 m., of scrambling habit; leaves light green; bracts subtending the female flowers reddish.

Homalanthus nutans Pax (*Croton nutans* Vahl., *Carumbium nutans* Müll. Arg., *Stillingia nutans* Geisel.).

Edge of rain forests, base of Mont Mou, no. 2068; tree 10 m. tall. Although there are in the axils of the bracts 2 and even 3 flowers, we do not hesitate—Mr. White and myself—to refer this plant to *H. nutans* and not to *H. Schlechteri*.

ANACARDIACEAE

Schinus terebinthifolius Raddi.

Dombea (naturalized), no. 2163; shrub or small tree mostly 3–5 m. high, of spreading habit; also very common on the hills about Noumea.

Semecarpus atra Vieill. (*Rhus* ? *atra* Forst.).

Dombea, no. 2161; tree about 17 m. high, with a dense spreading top; possesses a blistering sap; leaves dark green above, whitish beneath; inflorescence appearing very dark from the dense covering of hairs.

AQUIFOLIACEAE

Phelline microcarpa Baill.

Rain forests, foot of Mont Mou, no. 2084; small tree.

CELASTRACEAE

Pteripterygia marginata Loes.

Baie des Pirogues, no. 2187; shrub about 1.50—2 m. high, with light green leaves and white flowers. (Det. C. T. W.)

SAPINDACEAE

Guioa villosa Radlk. (*G. collina* Schltr., *Cupania villosa* Panch. & Seb., nomen.)

Edge of rain forest, base of Mont Mou, very abundant, no. 2076; a shrub attaining a height of 3 m. but often seen flowering when only about 1 m. high; flowers white.

Cupaniopsis oedipoda Radlk.

Rain forests, foot of Mont Mou, no. 2042; small tree of 5–7 m.

Elattostachys apetala Radlk. (*Cupania apetala* Labill.).

Rain forest, foot of Mont Mou, no. 2066; tree about 13 m. high, of very spreading habit, sparsely foliaged, young shoots bright red.

Gongrodiscus sufferrugineus Radlk.

Païta, no. 2174; tree of 13 m.

Dodonaea viscosa Jacq.

Small coastal scrub, Noumea, no. 2131; shrub 2.50 m. high.

RHAMNACEAE

Ventilago neo-caledonica Schltr. (*Ventilago leiocarpa* Weberb., non Benth.).

Baie des Pirogues, no. 2206; climber, climbing over low shrubs and trees on serpentine hills; flowers with an unpleasant odor.

Alphitonia neo-caledonica Guillaumin (*Pomaderris neo-caledonica* Schltr.).

Rain forest, foot of Mont Mou, no. 2075; tree of 20 m., with a spreading top; the bark when freshly peeled has a strong odor of sarsaparilla; fruit black when ripe. Inland from Baie des Pirogues, very common on the serpentine, no. 2114; small tree about 5 m. tall but often fruiting as a shrub of 1.5 m.; bark when peeled has a strong odor of sarsaparilla; local name "Pomaderris." (Det. K. W. Braid.)

ELAEOCARPACEAE

Elaeocarpus persicaefolius Brong. & Gris (*E. polychistus* Schltr. in herb.).

Païta, no. 2170; tree about 20 m. tall, with a spreading top, branches going out almost at right angles; leaves turning bright red when old; fruit blue. Tree very similar in appearance to the common eastern Australian *E. grandis*.

Elaeocarpus rotundifolius Brong. & Gris.

Dombea, no. 2156; a rather handsome tree about 12 m. high with a spreading top; leaves turning red when old as in most species of *Elaeocarpus*.

GONYSTYLACEAE

Solmsia calophylla Baill.

Rivière des Pirogues, no. 2241; small tree about 10 m. high; leaves very dark glossy green above, pale brown beneath.

STERCULIACEAE

Commersonia echinata Ait.

Edge of rain forest, base of Mont Mou, no. 2071; small slender tree, about 10 m. high, with spreading top.

DILLENIACEAE

Hibbertia altigena Schltr.

Mont Mou, in scrubby patches near and on the summit, no. 2027; shrub 1-1.20 m. high, of dense growth, young shoots suffused with red, leaves turning red when old; calyx silky, suffused with dull red, petals yellow.

Hibbertia Brongniartii Gilg (*H. lucens* Brong. & Gris).

Rivière des Pirogues, no. 2239; tree up to 50 ft. high, with a trunk 30 cm. in diam.; flowers yellow.

Hibbertia lucida Schltr. ex Guillaumin.

Baie des Pirogues, no. 2210; shrub or small tree of 3-4 m., of rather dense growth; flowers yellow.

Hibbertia podocarpifolia Schltr.

Common on edge of rain forest, base of Mont Mou, no. 2053; small tree of 5 m.; flowers yellow.

Hibbertia trachyphylla Schltr. (*H. scabra* Brong. & Gris, non R. Br.).

Inland from Baie des Pirogues, no. 2126; shrub about 4 m. high, growing in rather dry forest associated with *Melaleuca* and *Casuarina*; flowers yellow.

Tetracera Euryandra Vahl.

Dombea, abundant in open forest, no. 2153; a strong climber.

GUTTIFERAE

Calophyllum caledonicum Vieill. ex Planch. & Triana (*C. montanum* Vieill. ex Planch. & Triana)

Rain forests, Rivière des Pirogues, no. 2251; tree 20 m. tall; leaves dark glossy green above, paler beneath.

Garcinia amplexicaulis Vieill. ex Pierre (*Clusianthemum amplexicaule* Vieill.).

Inland from Baie des Pirogues, no. 2123; shrub 1.50 m., fairly common; flowers red.

Garcinia corymbosa Wall. (*Discostigma corymbosa* Panch. & Seb., *Garcinia Pancheri* Pierre, *Clusia Puat* Montr.).

Païta, no. 2175; tree 12 m. tall; petals white, very thick and fleshy; stamens numerous and purple.

Montrouzieria sphaeroidea Panch. ex Planch. & Triana (*M. sphaeraeflora* Panch. in Panch. & Seb.).

Rivière des Pirogues, no. 2124; shrub 3-4 m. high, of upright growth. Closely related to *M. rhodoneura* Schltr.

VIOLACEAE

Agation Deplanchei Brong. & Gris ex Guillaumin.

Rivière des Pirogues, no. 2236; climber.

Hybanthus austro-caledonicus Schinz & Guillaumin (*Ionidium austro-caledonicum* Vieill.).

Rain forest, Rivière des Pirogues, no. 2247; a small slender tree 10 m. tall; flowers white, lower lip with a few purple spots.

Hybanthus ilicifolius Schinz & Guillaumin forma *serratifolia* Guillaumin (*Ionidium serratifolium* Bak. f.).

Rain forests, Rivière des Pirogues, no. 2254; a small very slender tree 5 m. high, but often flowering as a shrub of about 1.5 m.; leaves dark green above, paler beneath; corolla lobes cream-colored, marked with purple.

FLACOURTIACEAE

Xylosma suaveolens Forst.

Rain forest, base of Mont Mou, no. 2094; a small tree.

Homalium Francii Guillaumin. Rain forests, base of Mont Mou, no. 2040; small slender tree about 7 m. tall; flowers in racemes, greenish suffused with red; filaments pink.

Casearia silvana Schltr.

Rain forest, base of Mont Mou, coll. *Garigou*, no. 2037; small tree, flowers white, in dense lateral and axillary clusters.

Microsemma salicifolia Labill.

In small coastal scrub, Noumea, no. 2140. Small tree 5 m., densely foliated.

RHIZOPHORACEAE

Rhizophora mucronata Lam.

Mangrove swamps, mouth of the Rivière des Pirogues, no. 2282; small

tree about 7 m. tall, with long, stilt (aërial) roots growing down into the mud from the larger branches.

Bruguiera eriopetala Wight & Arn. (*B. Rumphii* Bl.).

Mangrove swamps, mouth of Rivière des Pirogues, no. 2262; small trees mostly about 5 m.; trunk somewhat flanged at the base; roots developing a number of hard knobby pneumatophores; leaves on young vigorous shoots coppery red underneath.

Crossostylis grandiflora Brong. & Gris (*C. Sebertii* A. Gris). Rain forests, base of Mont Mou, no. 2017; tree 10 m. tall; flowers in bud only, buds 4-angled, calyx-lobes white, tinged with pink (flesh-colored), very thick; petals much smaller.

COMBRETACEAE

Lumnitzera coccinea Wight & Arn.

Mangrove swamps, mouth of the Rivière des Pirogues, no. 2281; shrub of 3 m., branching from near the base; the roots forming pneumatophores similar to those of *Bruguiera* but smaller.

MYRTACEAE

Myrtus paitensis Schltr.

Rain forest, base of Mont Mou, no. 2050; shrub about 2 m. high; flowers white.

Myrtus paitensis var.

Mont Mou, no. 2003; shrub, about 1.5 m. high; young branchlets and leaves reddish; flowers white.

Myrtus rufo-punctatus Panch. ex Brong. & Gris.

Mont Mou, scrubby slopes of hills, 1000 m. alt., no. 2023; shrub about 1 m. high; leaves becoming red with age; fruit black, of agreeable flavor.

Myrtus turbinatus Schltr.

Baie des Pirogues, no. 2128; shrub 1 m. high; flowers greenish white.

Rhodomyrtus andromedoides Brong. & Gris.

Rivière des Pirogues, no. 2103; small tree 7 m. high; flowers cream-colored.

Psidium guajava L.

Noumea, naturalized along roadsides, no. 2289; shrub or small tree.

Eugenia Gacognei Montr. (*E. Homei* Seem.).

Baie des Pirogues, without no.; shrub.

Calycorectes rubiginosa Guillaumin (*Schizocalyx rubiginosa* Brong. & Gris, *Spermolepis rubiginosa* Brong. & Gris).

Baie des Pirogues, coll. A. Varin, no. 2225; tree.

Syzygium lateriflorum Brong. & Gris.

Dombea, no. 2159; tree 12 m. tall, with densely foliated head; leaves dark green above, paler beneath.

Syzygium multipetalum Panch. ex Brong. & Gris (*Eugenia multipetala* Bak. f.).

Rivière des Pirogues, no. 2258; tree 12 m. tall, with spreading dense head; fruit 1 cm. in diam., first white, later red or blackish red.

Syzygium patens Panch. ex Brong. & Gris (*Eugenia patens* Panch. ex Bak. f., *Eugenia ngoyensis* Schltr.)

Rivière des Pirogues, no. 2110; shrub 1 m. high; flowers white, flushed red.

Syzygium sp.?

Rivière des Pirogues, no. 2227; tree about 13 m. tall, leaves lustrous dark green above, paler beneath; fruit subglobose or pyriform, 4 cm. in diam., dark red. The fruit which is detached may possibly not belong to this specimen.

Piliocalyx Baudouini Brong. & Gris.

Rain forest, base of Mont Mou, no. 2074; tree 12 m. tall; fruit large, white.

Xanthostemon rubrum Niedenzu.

Baie des Pirogues, without no.; small tree.

Xanthostemon sp., aff. *X. macrocephalum* Pampan.

Baie des Pirogues, in scrub on serpentine hills, no. 2202; small tree.

Spermolepis gummifera Brong. & Gris (*S. tannifera* Heck.).

Rivière des Pirogues, no. 2252; tree 20 m. or more high, with a spreading top. The principle hardwood of the island being to New Caledonia what the hardwood eucalypts are to Australia; timber largely cut but all used locally, not exported. Local name "Chêne Gomme."

Moorea artensis Montr. (*Cloezia ligustrina* Brong. & Gris). Dombea, no. 2157; shrub about 3 m. high.

Moorea artensis var.?

Baie des Pirogues, no. 2192; shrub 1-1.75 m. high; petals yellow.

Moorea canescens Beauvis. (*Cloezia canescens* Brong. & Gris; perhaps identical with *M. Deplanchei* Guillaumin [*Cloezia Deplanchei* Brong. & Gris]).

Baie des pirogues, no. 2179; shrub 2 m. high, of rather spreading habit.

Moorea floribunda Guillaumin (*Cloezia floribunda* Brong. & Gris). Rather dry forest, base of Mont Mou, no. 2051; tree about 7 m. tall.

Tristania Callobuxus Niedenzu (*Tristaniopsis Callobuxus* Brong. & Gris).

Rivière des Pirogues, no. 2108; small tree about 7 m. tall, with spreading top and dense foliage.

Tristania glauca Pancher (*Tristaniopsis glauca* Brong. & Gris).

Inland from Baie des Pirogues, no. 2106; shrub 1.75 m. high.

Melaleuca Leucadendron L. (*M. viridiflora* Gaertn.).

Dry, scrubby hillsides, Noumea, very abundant, without no.; small tree mostly about 5 m. high; anywhere near towns the trees do not get a chance to attain any size owing to their being so much cut for firewood. In swamps near Mouth of Rivière des Pirogues, no. 2266; tree about 13 m. tall, with a papery bark; when growing in swamps, not regarded as very satisfactory for fuel.

Melaleuca pungens Brong. et Gris.

Rivière des Pirogues, among rocks and along the river banks, usually leaning over the water, no. 2229; small tree about 4 m. tall but often seen flowering as a shrub of 1 m.; bark white, papery.

Baeckea ericoides Brong. et Gris.

Mont Mou, on open exposed scrubby hillsides, no. 2019; shrub 1.75 m. high, flowers white. Also seen at Baie des Pirogues.

Baeckea virgata Andr. (*B. parvula* DC., *Leptospermum parvulum* Labill.).

Edge of rain forest, base of Mont Mou, no. 2077; slender shrub of 3 m.; flowers white.

MELASTOMACEAE.

Melastoma denticulata Labill. Edge of rain forest, base of Mont Mou, no. 2018; shrub 2 m. high; flowers white.

ARALIACEAE

Meryta coriacea Baill.

Rivière des Pirogues; no. 2242; very slender tree about 10 m. high, usually with a single stem and with a tuft of leaves at the top; flowers bright lemon-yellow, in large terminal clusters.

Schefflera Gabriellae Baill.?

Rain forests, Rivière des Pirogues, no. 2244; slender tree about 13 m. tall.

Schefflera golip Baill.

Païta, no. 2176; tree about 13 m. tall.

Tieghemopanax austro-caledonicus R. Vig. (*Panax austro-caledonica* Baill., *Panax crenata* Panch. & Seb., *Polyscias austro-caledonica* Harms, *Aralia Gemma* Linden). Rain forest, base of Mont Mou, no. 2082; tree about 7 m. tall, with a spreading top.

Tieghemopanax dioicus R. Vig. (*Cussonia dioica* Vieill., *Polyscias dioica* Harms).

Rain forest valleys, inland from Baie des Pirogues, no. 2127; tree about 13 m. tall; flowers deep purple.

Myodocarpus fraxinifolius Brong. & Gris.

Rivière des Pirogues, no. 2228; tree 13 m. tall, with spreading top.

Myodocarpus involucratus Dub. & R. Vig.

Rivière des Pirogues, no. 2259; small soft wooded tree, about 7 m. tall; leaves light green.

EPACRIDACEAE

Leucopogon albicans Brong. & Gris.

Rivière des Pirogues, no. 2107; shrub 1 m. high; leaves light green above, whitish beneath; fruits small, red.

Leucopogon cymbulae Labill. (*L. Billardieri* Montr.)

Rather dry forests base of Mont Mou, no. 2057; small tree about 7 m. tall.

Leucopogon dammarifolius Brong. & Gris.

Rather dry forests, base of Mont Mou, no. 2044; tree about 7 m. tall; young shoots suffused with red; fruits red. Summit of Mont Mou, no.

2028; shrub 3-4 m. high; young shoots enclosed in bracts, when newly open very beautiful, the young leaves suffused with pink and glaucous beneath; fruit deep orange-color.

Dracophyllum gracile Brong. & Gris. (*D. cosmelioides* Panch. ex Brong. & Gris.).

Rivière des Pirogues, growing among rocks in the river, no. 2271; shrub about 1 m. high.

Dracophyllum ramosum Panch. apud Brong. & Gris (*D. amabile* Brong. & Gris).

Inland from the Baie des Pirogues, no. 2115; shrub about 3 m. high, of slender growth; flowers white.

Dracophyllum verticillatum Labill.

Mont Mou, on open exposed hillsides among scrubby vegetation, no. 2014; a very beautiful shrub, with the flowering spike about 1.75 m. high; flowers white, buds tinged with pink, slightly honey-scented.

MYRSINACEAE

Rapanea asymmetrica Mez.

Mont Mou in scrubby patches on hillsides, no. 2029; shrub of 2 m.; fruit small, green, streaked or dotted with brown.

Tapeinosperma Pancheri Mez.

Rain forests, base of Mont Mou, no. 2056; slender tree 10 m. tall; secondary branches of panicle, pedicels and calyces red; fruit green with dark streaks.

Tapeinosperma Whitei Guillaumin, n. sp.

Arbor, 10 m. alta, ramulis crassis, foliis obovatis (usque ad 15 : 7 cm.), basi rotundatis, apice rotundatis vel obtusissimis crassis glabris pagina inferiore punctis multis albido-pulverulenta, nervis 11-13-jugis, utrinque parce prominulis, venis immersis, petiolo brevi sed distincto, 0.4-1 cm. longo. Inflorescentiae terminales, bipinnatim paniculatae glaberrimae, pedicellis 4-5 mm. longis, floribus 3 mm. longis, sepalis late ovatis 2 mm. longis crassis atro-punctatis glaberrimis, petalis fere ad $\frac{1}{2}$ connatis ovatis apice subacuminatis, parte libera punctatis, extra glaberrimis, intus fauce dense lepidota, staminibus sessilibus, petalis 2-plo minoribus, ellipticis, facie interiore medio apiceque punctis 2 atris elongatis, facie exteriori ab apice usque ad medium zona atra notatis, apice lepidotis, ovario globoso glabro atro-punctato stylum fere aequante, stylo subulato.

Rivière des Pirogues, no. 2280; tree 10 m. tall.

The present species through its punctate sepals and petals and its corolla squamous at the mouth constitutes a passage between *C. nectandroides* and *C. deflexum*, *C. clethroides* and *C. robustum*; it is equally well characterized by the ornamentation of its stamens.

Maesa novo-caledonica Mez.

Rain forests, base of Mont Mou, no. 2079; climber, climbing to the tops of forest trees; fruits pale straw-colored with darker lines; bark said to be used as a fish poison by the natives.

SAPOTACEAE

Planchonella Pancheri Pierre (*Sideroxylon cinereum* Baill.).

Noumea, in small coastal scrub, no. 2100; tree 7 m. tall.

EBENACEAE

Maba parviflora Schltr.

Rivière des Pirogues, in heavy rain forests, no. 2245; tree about 13 m. tall.

Diospyros macrocarpa Hiern.

Rain forests, base of Mont Mou, no. 2067; tree about 13 m. tall; loaded with large pink egg-shaped fruits weighing down the branches.

OLEACEAE

Notelaea Badula Vieill. (*Osmanthus Badula* Hutchins. ex S. Moore).

Rivière des Pirogues, overhanging water courses, no. 2184; tree 5 m. tall; flowers white.

Notelaea vaccinioides Schltr. (*Osmanthus vaccinioides* Hochr.)

Baie des Pirogues, no. 2200; shrub 2 m. high.

Notelaea vaccinioides Schltr.?

Rivière des Pirogues, bordering on mangrove swamps, no. 2267; small tree 5 m. tall.

LOGANIACEAE

Geniostoma foetens Baill.

Rain forests base of Mont Mou, no. 2043; shrub 2.75 m. high, of very dense compact growth; flowers greenish white, with a very foetid odor like excrement.

Fagraea Schlechteri Gilg & Benedict (*F. grandis* Panch. & Seb., non *Carissa grandis* Bert. = *F. Berteriana* A. Gray),

Rain forests, base of Mont Mou, no. 2083; tree 13 m. tall, with a spreading top.

APOCYNACEAE

Melodinus Balansae Baill. (*M. inaequilatus* Baill., *M. intermedius* Panch. ex Guillaumin.).

Rivière des Pirogues, no. 2270; climber with milky juice.

Alstonia plumosa Labill.

Rain forests, base of Mont Mou, no. 2038; tree about 10 m. tall; bark grey; leaves glossy green above, pale and opaque beneath; flowers white. *Dombea* no. 2162; tree about 13 m. tall, with a light colored bark; flowers white.

Alstonia Vieillardii Van Heurck & Müll. Arg. (*A. Durkeimiana* Schltr.).

Rain forests, base of Mont Mou, no. 2054; slender tree 13 m. tall; flowers yellow.

Tabernaemontana cerifera Panch. & Seb.

Rivière des Pirogues, no. 2193; tree 7 m. high but often seen flowering as a shrub of 1.75–2 m.; flowers white, strongly jasmine-scented; fruit consisting of two boat-shaped follicles each 7 cm. long and 3.5 cm. wide but not seen quite ripe.

Rauwolfia semperflorens Schltr. (*Alyxia semperflorens* Panch.)

Rain forests, base of Mont Mou, no. 2049; shrub 2 m. high, flowers white. Rivière des Pirogues, no. 2191; shrub 1.75 m. high; flowers white; fruits small, blue-black.

Alyxia celastrinea Schltr. (*Gynopogon celastrineum* Baill.)

Noumea, in small coastal scrub, nos. 2139 and 2141; shrub 1.75 m. high, with milky sap; fruits black.

Alyxia celastrinea Schltr.?

Noumea, in small coastal scrub, no. 2150; shrub 1.75 m. high, of rather scrambling habit.

Alyxia leucogyne Van Heurck & Müll. Arg. (*A. grandis* Panch. & Seb., *A. sapiifolia* Schltr., *Gynopogon leucogyne* Baill.).

Rivière des Pirogues, no. 2249; climber.

Pterochrosia Vieillardii Baill.

Rivière des Pirogues, no. 2260; tree 13 m. high or more, with a candelabrum-like habit of branching; branchlets exuding an abundant milky sap when cut; flowers white.

Ochrosia miana Baill.

Rain forest valleys, inland from Baie des Pirogues, no. 2117; tree 20 m.; fruits large, orange-colored.

Cerbera manghas L. (*C. Linnaei* Montr.).

Dombea, common everywhere along streams and on edge of the rain forest, no. 2167; tree 13 m. tall; branchlets very milky when cut; flowers white with an orange throat, strongly scented.

VERBENACEAE

Lantana Camara L.

Noumea, naturalized along road-sides, etc., no. 2146; shrub, mostly about 1 m. high of scrambling habit; flowers from almost white to dark pink, with usually orange throat. Noumea, no. 2142; a form with bright red flowers. (Det. C. T. W.)

Vitex trifolia L.

Noumea, along the harbor front, no. 2148; shrub 3 m. high, of spreading habit; flowers lavender.

Oxera robusta Vieill.

Rain forests, base of Mont Mou, no. 2088. Liane climbing to the tops of forest trees.

Clerodendron inerme R. Br.

Noumea, along the harbor front, no. 2145; shrub 2-3 m. high of very rambling habit; corolla white; filaments purple, long-protruding. (Det. C. T. W.)

Avicennia officinalis L. (*A. resinifera* Forst. f.).

Noumea, along the harbor front a little below high-water mark, no. 2147; tree 10 m. tall; leaves dark green above, whitish underneath; flowers orange-colored, honey-scented.

SOLANACEAE

Duboisia myoporoides R. Br.

Rain forests, base of Mont Mou, no. 2080; tree 13 m. tall; bark thick and corky; flowers white.

BIGNONIACEAE

Diplanthera Deplanchei F. Muell.

Rain forests, base of Mont Mou, no. 2060; tree 20 m. tall; calyx bronzed; corolla and stamens yellow. Also seen at the Rivière des Pirogues. (Det. C. T. W.)

GESNERACEAE

Coronanthera pedunculata C. B. Clarke var. **stellata** C. B. Clarke.

Base of Mont Mou, no. 2057; small tree, overhanging water courses in rain-forests, of straggling growth, about 7 m. high; leaves dark green above, pale beneath; flowers cream-colored, with dark streaks often suffused with pink.

ACANTHACEAE

Acanthus ilicifolius L. Tidal swamps, Dombéa, no. 2165; shrub 1.25 m. high; corolla-lip white in the lower half, lavender in the upper half. (Det. C. T. W.)

RUBIACEAE

Gardenia lucens Panch. et Seb.

Noumea, in small coastal scrub, no. 2101; tree 5-7 m. tall.

Gardenia platyxydon Vieill. ex Panch. & Seb.

Noumea, coastal scrub, no. 2138; small tree 5 m. high.—On account of its elongated fruit this species seems to be referable to the genus *Atractocarpus*.

Timonius platycarpus Montr. (*Guetarda fusca* Pancher ex Baill.).

Rivière des Pirogues, no. 2275; shrub 2 m. tall; flowers white.

Psychotria calothyrsus Guillaumin, comb. nov. (*Uragoga calothyrsus* Baill.).

Rain forests, base of Mont Mou, without no.; shrub; fruits white.

Psychotria Fagueti Schltr. (*Uragoga Fagueti* Baill.; *Cephaelis Fagueti* S. Moore)? vel *P. Schumanniana* Schltr. (*Cephaelis Schumanniana* S. Moore)?

Mont Mou, in rain forest at the top of the mountain, no. 2034; shrub about 3 m. high; fruit hairy, purple.

Psychotria oleoides Schltr. (*Uragoga oleoides* Baill.).

Rivière des Pirogues, no. 2250; tree 7 m. tall; flowers greenish white.

Psychotria Pancheri Schltr. (*Uragoga Pancheri* Baill., *Cephaelis Pancheri* S. Moore).

Rain forests, base of Mont Mou, no. 2089; small tree.

Psychotria rubiginosa Guillaumin (*P. Pancheri* var. *rubiginosa* Baill. in herb.).

Rain forests, base of Mont Mou, no. 2062; small tree about 5 m. high; flowers in a dense terminal sessile head surrounded by white bracts.

Psychotria rupicola Schltr. (*Uragoga rupicola* Baill.).

Inland from Baie des Pirogues, no. 2104; shrub 1.75 m. high; branches of panicle and flowers white.

Psychotria sp. nov.

Rain forest, base of Mont Mou, very common, no. 2059; shrub about 1.25 m. high, calyx dull red, corolla deep rose-pink; fruit blue.

Mapouria Balansae Beauvis. (*Uragoga Balansae* Baill., *Cephaelis Balansae* S. Moore).

Mont Mou, in rain forest on the top of the mountain, no. 2035; shrub 2 m. high; fruit dark purple.

Mapouria Deplanchei Beauvis.? (*Douarrea alba* Montr.? *Mapouria Douarrei* Beauvis.?).

Rain forests, base of Mont Mou, no. 2061; shrub 1.50 m. high; fruits white.

Mapouria speciosa Beauvis. (*Douarrea speciosa* Montr., *Psychotria speciosa* S. Moore). Rain forests, base of Mont Mou, nos. 2004 and 2090; shrub 2 m. high; branches of inflorescence red; calyx red, corolla pink.

Normandia neo-caledonica Hook. f.

Mont Mou, in open scrubby situations, no. 2007; a low shrub 0.75 m. high; leaves glossy, green above, very pale beneath; flower white with a faint purplish tinge.

Morinda Forsteri Seem. (*M. umbellata* Forst.; non L.).

Noumea, in small coastal scrub, no. 2134; climber, climbing over small trees and shrubs; flowers yellow, sweetly scented.

GOODENIACEAE

Scaevola Beckii Zahlbr.

Mont Mou, exposed scrubby hillsides, no. 2012; mostly an unbranched undershrub, about 0.75 m. high; leaves coriaceous, turning red when old, corolla lobes white on the upper face, brownish below.

Scaevola cylindrica Schltr. & Krause.

Rivière des Pirogues, no. 2232; spreading shrub, 2 m. high; flowers white.

Scaevola saligna Forst. f. (*S. montana* Labill.).

Edge of rain forest, base of Mont Mou, no. 2065; shrub 1 m. high, of spreading habit; corolla-lobes white on inner face, back of corolla and corolla-tube cream-colored. Noumea, in small coastal scrub, no. 2137; shrub 1.25 m. high, of spreading habit; flowers white suffused with purple. Baie des Pirogues, no. 2195; shrub 1.25 m. high, of spreading habit; flowers white; fruits purplish black, fleshy.

COMPOSITAE

Helichrysum neo-caledonicum Schltr.

In dry forests and edge of rain forests, base of Mont Mou, no. 2055; shrub about 1.50–2 m. high, of dense growth and spreading habit and of grayish appearance.

THE LIGNEOUS FLORA OF HOT SPRINGS NATIONAL PARK
AND VICINITY

ERNEST J. PALMER

THE Hot Springs National Park, embracing the hot springs in Garland County, central Arkansas, and an area of mountainous country about two miles square surrounding them, which is in part the subject of this phytographic study, was the first reservation of this character made by the federal government for the benefit of the public. It therefore has a special historical interest as the nucleus of that magnificent system of national parks and monuments which is preserving for us so many of the most beautiful and wonderful works of nature in various parts of the country, some of which might otherwise have been impaired by commercial exploitation or at least have long remained inaccessible to many of those who may now enjoy them. Unlike most of the other parks, however, the reason for setting aside this first national resort was not primarily on account of its scenic beauty, although it is not without valid claims in that direction. But it was due to the fact that the federal authorities in charge of administering the affairs of the Missouri, and later of the Arkansas Territory, in which they were located, early realized the necessity of establishing a permanent and more rigid control over the hot springs, which even then were resorted to by many travelers for the supposed therapeutic value of the waters.

The first act of Congress establishing the National Park was passed in 1834, the lands surrounding the hot springs having been ceded to the United States by the Quapaw Indians in 1818. The park as originally bounded contained a little over 2500 acres, but this area has since been somewhat diminished by the establishment of the town of Hot Springs in 1876, to which the government ceded, by gift, lands for street and alley purposes. The town or city claims at present a permanent population of about 15,000, while the number of tourists and guests domiciled there at some seasons probably exceeds twice that number. It is a little city of hotels, apartments and bath houses, picturesque and attractive both by reason of its natural environments and the progressiveness of its citizens. Practically all business is based upon the principal industry of catering to the tourists, in addition to which there are some small lumber mills and a limited agriculture in the surrounding country. The population of the town is largely American but has been drawn from many sources, and visitors of all classes are attracted from every part of the United States and many from abroad. The student of humanity will not fail to note here the curious contrasts that result from the mingling of this cosmopolitan crowd with the somewhat primitive inhabitants of the surrounding country. It may be noted also that a spirit of friendliness, courtesy and fair dealing on the part of the townspeople towards visitors prevails to a degree not always met with in similar places.

The earliest visitors who came to the hot springs to "take the baths"

and seek health from its mysterious waters were undoubtedly of the prehistoric tribes that inhabited the region long before its discovery by white men. This fact is attested both by tradition and archaeological evidence. It is said that the locality was held as neutral territory by the various hostile tribes, and that they laid aside their feuds and their war clubs when they gathered here to enjoy the gifts of the great Manitou who presided over it. How much of this is fact and how much poetic fancy it is impossible to say. But there was another incentive besides the hot springs that attracted the red men to the locality, of which more substantial evidence remains: this was the deposits of novaculite, which outcrop on several of the mountains surrounding the springs, and which afforded a resource perhaps even more important to the barbarian culture of those times than is the iron of Michigan or the coal of Pennsylvania to the civilization of our own. This fine grained silicious rock, on account of its clear conchoid fracture, could be shaped readily into a keen cutting edge, and because of its superior quality for the manufacture of weapons and domestic tools it became the basis of an important primitive industry and barter. Some of the beds were extensively, though no doubt intermittently worked, probably for many centuries, and artifacts from this source are found scattered over a wide territory, especially to the south, through the Red River valley and to the Gulf of Mexico.

The first white men supposed to have visited the Hot Springs region were Ferdinand de Soto and his followers, who towards the middle of the sixteenth century set out to explore the great continental province, then known as Florida, in search of fabled mines and populous cities, which they confidently believed would rival those of Mexico and Peru. In the course of their wanderings through the trackless forests and swamps of the lower Mississippi Valley, having crossed that great river somewhere below the present site of Memphis, they turned to the west, traversing parts of the rugged Ozark region until they reached an Indian town on the Ouachita River. Here they spent about three months of the winter of 1541-42, being detained, as the historian of the expedition relates, by deep snows. This circumstance would seem to indicate an unusually severe winter at that date, as the snowfall recorded at present in the locality is generally very light or entirely lacking.

Although the references by the historians of de Soto's expedition to this part of their travels, as indeed to the geography of the entire journey, is somewhat vague and uncertain, there can be little doubt that their route led them through this locality, and that it was from their winter camp somewhere in the vicinity of the hot springs that this gallant and unfortunate adventurer, the cavalier Ferdinand de Soto, set forth on the last tragic stage of his wanderings, that were to end for him a few months later in a watery grave beneath the floods of the great river he had discovered. The de Soto cold spring in the National Park is indeed supposed to commemorate the visit of the Spaniards to the locality and to mark

the site of their camp, but its claim to any authentic connection with the event probably rests on no better foundation than a poetic tradition of a much later date.

It was many years after the visit of the Eldorado-seeking Castilians before we again hear any account of the hot springs or their vicinity. In the two and a half centuries intervening between that event and the exploration by a party connected with the Lewis and Clark expedition of 1804, trappers, hunters and travelers must have found their way there from time to time without leaving any account of the event, for it is stated in the report at that time that white men were already visiting the springs for the purpose of taking the baths. The curious circumstance that this extremely interesting locality was for so long a time overlooked by the various travelers who explored and described the lower Mississippi valley and the Louisiana Territory, is only to be accounted for by the fact that it lay in a rugged and inaccessible country, some distance away from any of the great navigable rivers, which then furnished the only main avenues of travel through the uncharted wilderness.

Du Pratz, in his *History of Louisiana*,¹ does not mention the hot springs, which were then included within that province, and Darby merely alludes to them in a brief paragraph.² Even the energetic and scientifically enthusiastic Nuttall, on his remarkable journey up the Arkansas River in 1819, does not appear to have visited the locality, but gives a brief description of it based upon information received from others.³ It would appear, however, that the hot springs were rather well known at that time, for in another place he mentions them as amongst the resorts frequented by "Southern gentlemen who pass their summers in quest of health and recreation."

Schoolcraft⁴ visited the hot springs in 1819 and Featherstonehaugh⁵ in 1835, and both published brief accounts of the geology. Descriptions of the geological formations of the Ouachita Mountains and of the hot springs, or references to them have appeared in several other works: Amongst the most important of these are the reports of Owen,⁶ 1860, and of Williams,⁷ 1891. A brief general description of the hot springs and the National Park, by J. K. Hayward, with a geological sketch by Walter

¹ Du Pratz, M. Le Page. *Histoire de la Louisiane*. Paris, 1758.—English translation, London, 1774.

² Darby, William M. *State of Louisiana, 176–177*. New York, 1817.

³ Nuttall, Thomas. *Journal of Travels into the Arkansas Territory, during the year 1819, 215–216*. Philadelphia, 1821.

⁴ Schoolcraft, Henry Rowe. *A view of the lead mines of Missouri, including some observations on the mineralogy, geology, geography, antiquities, soil, climate, population and productions of Missouri and Arkansas, and other sections of the Western Country*. New York, 1819.

⁵ Featherstonehaugh, G. W. *Geological Report of an examination made in 1834 of the Elevated Country between the Missouri and Red Rivers*. Washington, 1835.

⁶ Owen, David Dale. *Second Report of a Geological Reconnaissance of the Middle and Southern Counties of Arkansas, made during the years 1859 and 1860*. Philadelphia, 1860.

⁷ Williams, J. Francis. *The Igneous Rocks of Arkansas, Annual Report of the Geological Survey of Arkansas, II*. Little Rock, 1891.

Harvey Weed, was published by the United States government in 1902.¹ Some of the facts in this introduction have been drawn from these sources.

While it thus appears that the extremely interesting geology of the Hot Springs region has not been neglected during the past hundred years, very little attention seems to have been given to the botany, although, judging from the several brief visits which the writer has been able to make there recently, it possesses an unusually rich and varied flora, which offers an attractive field for exploration in that direction.

In Branner and Coville's list of the Plants of Arkansas several species are recorded as having been collected at Hot Springs, and incidental references to the plants of this region have appeared in various publications. Dr. George Engelmann of St. Louis, Mr. G. W. Letterman of Allenton, Missouri, Mr. Richard D'Ailly of Little Rock, Dr. F. V. Coville, and Professor F. L. Harvey, the last named, during his connection with the Arkansas Industrial University at Fayetteville, did some plant collecting about Hot Springs during the nineteenth century, and probably a number of other botanists have also visited the locality. But, so far as I have been able to discover, no systematic list of the plants nor general botanical description of the region has yet appeared.

The present botanical sketch and list of the ligneous plants is based on observations and collections made on several short visits to Hot Springs during the years 1923, 1924 and 1925. The aggregate time spent in the vicinity was between two and three weeks, mostly in excursions afoot in the National Park and for some miles beyond, and it was about equally divided between the spring and autumn seasons. An attempt was made to collect and identify all of the woody native and spontaneous plants seen; but as each trip has added something new to the list, and as the very rugged and diverse region could be only very partially explored in so brief a time, it is quite probable that some species have still been overlooked. In addition to the 200 species and varieties of woody plants of the following list, between two and three hundred herbaceous species were also collected, of which a complete list cannot be given here, but incidental reference will be made to some of them in connection with the general description of the region and of the ligneous flora. A complete set of specimens of the woody plants is deposited in the herbarium of the Arnold Arboretum, and duplicates of most of them are in the herbaria of the Missouri Botanical Garden and the University of Arkansas; specimens of many of the herbaceous plants have also been sent to the last two institutions.

The limits of the area included in this survey, and from which the plants of the appended list were taken, extends from the Big Chalybeate Spring, about three miles northwest of the town of Hot Springs, to the Ouachita River on the south, from the bridge on the Arkadelphia road to the village of Lawrence, and eastward to a little beyond High Point, a

¹ Senate Document no. 282. Washington, 1902.

flag station on the Missouri Pacific railroad, or in general within a radius of from four to ten miles of the town. However, it was possible to explore thoroughly only a small part of this area, most of the collecting having been done on the mountains in the National Park and in the immediate environs of the town, in the valley of Hot Springs Creek to the Ouachita, and along the various branches and tributaries of Gulpha Creek.

The Ouachita Mountains occupy the southeastern extremity of the great interior elevation broadly designated as the Ozark region. Both in geological history and structure they are, however, quite distinct from the main Ozark plateau and Boston Mountains, to which the name is sometimes and more accurately restricted. The topography and rock formations are also very different from those of the mountains to the west, in west-central Arkansas and eastern Oklahoma. The rocks of the Ouachita Series consist of rapidly alternating beds of shale, sandstone, quartzite, conglomerate and novaculite. These represent a long succession of marine deposits extending from Ordovician to Sub-Carboniferous time. These originally horizontal strata have been broken up, folded and tilted in a very complex manner. Dikes of a fine grained black syenitic rock traverse them in various directions, and masses of granite occur a few miles east of Hot Springs and near Magnet Cove and Little Rock. The time in geologic history when the upheaval of the mountains occurred, and consequently the age of the intrusive rocks, is indicated by the contact of the latter with beds of Cretaceous limestone that are found locally in some parts of the area. Ash beds and other evidences of volcanic activity have been identified in places, and the hot springs are evidently the last lingering activity of this period of disturbance.

The mountains in the vicinity of Hot Springs are mostly in the form of extended chains or ridges, divided by narrow valleys. The general trend is from northeast to southwest. The sharp crests of the ridges are formed by the upturned edges of hard thick beds, usually of novaculite or quartzite; in most cases these stand at an angle of 45 degrees or higher from the horizontal. Most of the hills are of moderate height, their tops seldom exceeding six or seven hundred feet above the dividing valleys. The valley of the Ouachita River a few miles south of Hot Springs has a minimum elevation of a little less than three hundred feet above mean Gulf tide, and the crests of a few of the highest mountains slightly exceed 1300 feet. Besides the hot springs, many cold springs issue from the bases of the mountains, which, together with the rather abundant rainfall, give rise to numerous perennial or intermittent streams, all of which ultimately find their way into the Ouachita River.

The Ouachita River is the largest stream traversing the region and the only one of much consequence. Just south of Hot Springs, after it has received the Mazon Creeks from the south and several other tributaries, it is an imposing stream of considerable volume, sometimes over one hundred yards in width. The banks are in many places steep and rocky,

but are not characterized by high perpendicular bluffs such as are found along most of the streams farther north in the Ozark region. Near the mouth of Hot Springs Creek the river has cut its way through a gap in the mountains, and its waters spread out into shallow ripples and rapids as they dash across the upturned strata that cross its channel. The scenery here is quite wild and picturesque and there is much of botanic as well as of geologic interest. This locality will be mentioned again in connection with a description of the flora. The river, the Indian name of which has been variously spelled: Wachitta, Washitaw, Washita, Ouachitta and Ouachita, has its rise in the high lands to the west, near the Oklahoma line, and it joins the Red River in Louisiana, just above its confluence with the Mississippi. The principal tributaries of the Ouachita, within the area we are considering, are Hot Springs Creek and Gulpha Creek, with its several branches.

Hot Springs Creek, as its name indicates, has its origin in the thermal springs that issue from the base of the mountain of the same name. It flows almost directly south for its total length of about five miles to its junction with the Ouachita. In this short distance it has a fall of about 300 feet through its narrow rocky valley. In its primitive condition it must have been a most romantic and beautiful little stream. At present its upper course is obscured or completely concealed by the city, and through a very short-sighted policy its valley a mile or two below has been made a public dumping ground, and the city sewers allowed to discharge into it instead of being carried directly to the river. The greater part of its course is marred by this profanation, but in spite of it there is still some quite picturesque scenery in the lower portion, where the stream has cut through the syenite dikes and the waters dash among great masses of rock. This creek in its short course receives no tributaries except the intermittent floods of numerous ravines and a few small seeping springs. In times of heavy rainfall, however, the run-off from the surrounding hills is very considerable, and the stream carries a great volume of water down to the river.

The valley of Hot Springs Creek is narrow, in some places the rocky hills extending quite to the margins of the stream, and in its widest parts it seldom exceeds three or four hundred yards across. It has scarcely reached the stage in the cycle of development where real alluvial flood plains are developed, and the surface is more or less rocky throughout its entire extent. The accumulations of residual soil, however, are sufficiently great to support a rich and varied flora, differing markedly from that of the surrounding hills. The difference consists largely in the greater wealth of species found here, most of the trees and shrubs of the uplands extending into the valley where they are associated with many other species both ligneous and herbaceous, that are restricted to the latter zone. Owing to the narrow limits of the valley and the generally rocky character of the land but little of it has been cleared. No doubt

there has been much thinning of the forest, resulting in a considerable modification of its primitive condition, and some species may even have disappeared; on the other hand a number of introduced species are now found, especially in the upper part, but for the most part the flora is still intact and probably retains much of its original composition.

Gulpha Creek, which joins the Ouachita some six or seven miles farther down its course, is a somewhat larger stream than that originating in the hot springs. Its several branches have their sources in the mountains lying to the east and northeast of the town and National Park. Its principal forks are East Branch, Middle Branch, or Mill Creek, and West Branch. The two latter unite to form the main stream about five miles above its mouth, and the East Branch joins them three miles lower. The Middle Branch is the largest of these creeks, having its origin near High Point, about 12 miles east of Hot Springs. All of these branches are swift flowing perennial streams, and they receive in their courses accessions from many springs. The waters in many places dash over and amongst the rocks that beset their channels, forming miniature cascades and rapids, and at intervals they widen out into limpid pools or divide into several rivulets. Often the banks are steep and rocky and there is practically no valley, or again it widens out into flat but rocky flood plains, or in passing through sandy areas where seeping springs emerge, small bogs are formed, where a profusion of *Sphagnum* moss, ferns and sometimes Orchids and other hydrophytes flourish amongst thickets of characteristic shrubs and trees.

In studying the forests and plant associations the following ecological divisions may be recognized: the rocky uplands, rocky stream valleys, alluvial flood plains, sandy bogs, barrens and glades. Practically the entire area is wooded. And while the timber has been heavily culled to supply the numerous small saw mills, and some small areas have been cleared for agricultural purposes, these operations have not as yet been sufficiently extensive to seriously affect the character of the country or the composition of the flora. This is of course more particularly the case in the National Park, where the timber is being preserved and but little artificial planting has been done, but to a less extent it applies also to the general country beyond these boundaries. It is a safe estimate to say that more than 95 per cent of the surface is rocky, including all of the uplands and the greater part of the stream valleys. The only real alluvial bottoms are in the valley of the Ouachita River, even the largest of the swift flowing mountain streams not having yet developed this type of flood plain. There are no permanent swamps such as those so extensively developed in the valleys of the Mississippi, Arkansas and other large rivers of the region; and although traces of a prairie flora are found in some of the small glades, no real prairies occur here.

The forests are of the type characteristic of the southern part of the Ozark region: generally mixed stands of Pine and deciduous species, the

former sometimes predominating over small areas or developing pure stands, while trees and shrubs of the latter class form much the larger percentage of the flora, often to the exclusion of the Conifers. The trees are usually of a small or moderate size except in the stream valleys, although sometimes fine specimens of Oaks, Gums and Ash are found in favorable situations on the mountain sides. As the Ouachita Mountains constitute the last outpost of the mid-continent elevation and are flanked on the east and south by the lowlands of the Mississippi valley and the coastal plain, it is not surprising that a number of trees and shrubs, as well as herbaceous plants, characteristic of these provinces and not usually found in the uplands, have managed to invade the area and maintain themselves along the valleys of the creeks and rivers. More interesting, however, is the presence here of a number of species of the southern Appalachians, some of which extend far to the westward into the borders of Oklahoma, indicating a former connection between the mountain floras of these two regions, now effectively separated by the wide barrier of the river valley.

The rocky uplands, which may be loosely subdivided into comparatively level surfaces and steep mountain slopes, occupy by far the greatest part of the area. Short-leaf Pine and a few species of Hickories and Oaks constitute a great part of the larger timber over the more level portions. Characteristic species are *Pinus echinata*, *Carya alba*, *C. Buckleyi* var. *arkansana*, *Quercus alba*, *Q. stellata*, *Q. marilandica*, and less frequently, extending from the valleys, *Juglans nigra*, *Quercus rubra*, *Ulmus alata*, *Liquidambar styraciflua* and *Nyssa sylvatica*. Amongst smaller trees and shrubs are *Prunus lanata*, *P. mexicana*, *Cornus florida*, *Bumelia lanuginosa*, *Ceanothus americanus*, *Vaccinium arboreum*, *V. vacillans* and *V. stamineum*, although some of these are also common in the rocky valleys. The character of the steep mountain slopes and of their flora depends somewhat upon the pitch of the strata and their orientation. On the side corresponding to the dip, the surface, except where broken by ravines, may be comparatively regular and, if this faces approximately west or south, the flora described above may extend nearly to the summit, sometimes with the addition of such species as *Ostrya virginiana*, *Celtis pumila* var. *georgiana*, *Robinia pseudoacacia*, *Prunus serotina* and *Rosa subserulata*. On the opposite side of the mountain ridge, where the crest of the upturned strata terminates in a hanging wall, much more rugged conditions generally prevail: large detached masses of rock and low cliffs stand out, and there are great accumulations of rubble in places. This is not without effect upon the flora, offering a variety of conditions as to light, soil and moisture, especially if the exposure is towards the north or east. An excellent example of this may be seen along the north side of West Mountain, both within and beyond the boundaries of the National Park, where the flora is exceptionally rich in both woody and herbaceous plants. *Castanea ozarkensis*, *Quercus borealis* var. *maxima*, *Ilex caroliniana*, *Tilia floridana*, *Vitis cordifolia*,

Lonicera flava, and more rarely *Staphylea trifolia* and *Aralia spinosa* are characteristic trees and shrubs in such places. Amongst herbaceous plants there are a variety of ferns, including such rupestral sorts as *Dryopteris marginalis*, *Cheilanthes lanosa*, *C. tomentosa*, *Asplenium parvulum* and *A. Trichomanes*, and the more shade loving *Adiantum pedatum*, *Polystichum acrostichoides* and *Athyrium angustum*. *Trillium recurvatum*, *Asarum canadense*, *Arisaema triphyllum*, *Caulophyllum thalictroides* and many other shade and moisture loving plants are found in rich coves; and in more open situations beds of the beautiful Bird-foot Violet, Larkspur and Indian Pink occur, followed later in the season by Blazing Star, False Foxglove and many species of Asters, Solidagos and Legumes.

Most of the trees of the uplands, as has been stated, descend into the rocky creek valleys. And there too are found such species as *Pinus Taeda*, *Salix nigra*, *Carpinus caroliniana*, *Carya cordiformis*, *Quercus Phellos* and more rarely *Q. nigra* and *Q. Muhlenbergii*, *Ulmus americana*, *Celtis laevigata*, *Morus rubra*, *Platanus occidentalis*, *Gleditsia triacanthos*, *Acer rubrum* var. *tridens*, *Diospyros virginiana* and *Fraxinus pennsylvanica* var. *lanceolata*. Many smaller trees and shrubs are also growing in this type of forest, and in the more open places these often predominate and develop something like thickets, which, however, are never very extensive, although they have probably increased in recent years as a result of clearings and forest thinning. Various species of *Crataegus*, *Prunus americana*, *Rubus Andrew-sianus*, *Rosa setigera* var. *tomentosa*, *Rhus copallina*, *R. glabra*, *R. Toxicodendron*, *Ilex decidua* and *Sassafras officinale* form a large part of this smaller growth; *Cornus racemosa*, *Amorpha fruticosa*, *Evonymus americanus* and *Alnus rugosa* often grow in wet springy ground. Along the immediate margins of the streams, and on the rocky shingle brought down in times of flood, there are several characteristic woody species: *Alnus rugosa* is commoner here than in the last named situation, and *Salix longipes* var. *Wardii*, *Hamamelis vernalis*, *Amorpha nitens* and *Cephalanthus occidentalis* are usually confined to this narrow zone. Several introduced trees and shrubs have appeared in the upper part of the valley of Hot Springs Creek and along several of the smaller streams in the vicinity of the town: *Morus alba*, *Maclura pomifera*, *Catalpa speciosa*, *C. bignonioides*, *Melia Azedarach*, *Paulownia tomentosa* and *Lonicera japonica* were found here, and some of them are becoming abundant. Introduced weeds are also abundant in association with the adventive woody species, but for the most part the native flora has not been much altered and in the more remote parts of the valleys it remains in a primitive condition. Most of the native herbaceous plants found here extend also into the rocky woods or other ecological environments. *Phlox pilosa*, *Pentstemon arkansanus*, *Monarda Brad-buriana*, *Salvia azurea* and *Agalinis tenuifolia* are often abundant, and showy in flowering season; *Amsonia ciliata*, growing in large frutescent clumps, is conspicuous on gravel bars; and *Iris cristata*, *Sanguinaria canadensis* and *Dodecatheon Meadia* along moist rocky banks bordering the

valley. The pretty yellow flowered Honeysuckle, *Lonicera flava*, and the handsome flowering shrub, *Styrax grandifolia*, flourish in places along the low rocky bluffs. Towards the heads of the mountain streams the *Styrax* is even more abundant, descending into the narrow rocky valleys in association with *Amorpha glabra*, *Hamamelis macrophylla* and *Viburnum prunifolium*. Here, too, on the steep rocky slopes are sometimes found patches of the beautiful Azaleas, *Rhododendron roseum* and *R. canescens*, and in a few places the southern Sugar Maple, *Acer leucoderme*, usually only a shrub, although where it descends into the protected valleys it becomes a small tree.

Along the upper courses of these mountain streams occur the little sandy bogs, always very local, resulting from perennial springs issuing in sandy or rich humus laden soil. In spite of their small extent the flora of these little bogs is usually quite distinct and interesting, being composed largely of species of the coastal plain, which have managed to take possession of these favored spots. Red Maple, Sweet Gum and a few other trees may be present, but shrubs form the bulk of the woody flora. *Alnus rugosa* is very common here, with Spice Bush (*Benzoin aestivale*), *Itea virginica*, *Ilex opaca*, *Viburnum nudum* and sometimes *Rhododendron oblongifolium* and *Myrica cerifera*. The herbaceous flora is often very rich; growing amongst the Sphagnum moss are many ferns, orchids and other moisture loving plants, including *Osmunda regalis*, *O. cinnamomea*, *Woodwardia virginica*, *W. areolata*, *Onoclea sensibilis*, *Isoetes melanocarpa*, *Habenaria dilatata*, *Pogonia verticillata*, *Chamaelirium luteum*, *Lobelia puberula*, *Bartonia virginica*, *Viola blanda* and many others.

The alluvial bottoms of the Ouachita, originally heavily wooded, have been largely cleared for agricultural use. The remnants of this forest that remain contribute a few species not found elsewhere or at least not commonly. *Betula nigra* and *Acer saccharinum* are typical riparian trees and *Populus balsamifera* var. *virginiana*, *Celtis laevigata*, *Acer Negundo* var. *texanum*, *Frazinus pennsylvanica* var. *lanceolata*, *Cornus stricta* and the woody vines, *Calycocarpum Lyoni*, *Brunnichia cirrhosa* and *Bignonia capreolata* are typical species of the lowland forest.

More interesting is the peculiar assemblage of plants that has taken possession of the rocky banks and shingle bars and islands of the flood plains along the riffles and rapids of the river, near the mouth of Hot Springs Creek. A shale bed outcrops in the bed of the river near this point, and the bluffs above are composed of sandstone, quartzite and other hard siliceous strata, the detritus from which has been washed down by the river to form or cover the extensive bars and islands that beset its channel for some distance below. Both the shale outcrop and these shingle-covered bars are submerged in every freshet, but at ordinary stages of the river become dry and sun scorched. Besides the woody plants usual in such situations, several distinctly swamp species and others of rather xerophytic character are found here: *Carya aquatica*, *Planera*

aquatica and *Styrax americana* look strange in such an environment but all of them appear to flourish. *Salix longipes* var. *Wardi*, *Platanus occidentalis* and *Hypericum prolificum* are very abundant, and growing with them on the gravel bars are *Salix nigra*, *Platanus occidentalis*, *Liquidambar styraciflua*, *Ilex decidua* and the woody vines: *Vitis palmata*, *V. rupestris*, *Wistaria macrostachya* and *Bignonia capreolata*. On the shale outcrop are found *Polygonella americana*, *Andrachne phyllanthoides*, *Amorpha glabra*, *A. fruticosa*, *A. croceo-lanata*, *Hypericum prolificum* and *A. cistifolium*. Conspicuous perennials are *Amsonia ciliata*, *Grindelia lanceolata*, *Vernonia Lettermani* and *Coreopsis lanceolata* var. *villosa*. On the rocky banks just above the shale bed *Ilex vomitoria* is growing, and on the opposite or north-facing bluff, *Philadelphus pubescens*, *Ulmus serotina* and *Halesia monticola* var. *vestita*. On exposed rocky ledges here was also found the pretty purple flowered Crucifer, *Streptanthus maculatus*, found and described by Nuttall from a similar place along the Arkansas River.

The rocky barrens and glades of the Hot Springs area are of very limited extent. Most of them occur where the small streams have exposed beds of shale or other rocks, or along naked ledges and outcrops of silicious rocks on the mountains. The typical flora is largely herbaceous, but includes such slender shrubs and barely woody plants as *Opuntia humifusa*, *Hypericum cistifolium* and *Rosa subserulata*. Amongst characteristic herbaceous species are *Cheilanthes lanosa*, *Talinum calycinum*, *Tragia ramosa*, *T. macrocarpa*, *Polygonum tenue*, *Asclepiodora viridis*, *Onosmodium occidentale*, *Trichostema dichotoma*, *Grindelia lanceolata* and *Aster oblongifolius*, to mention only a few of the more common ones. In the absence of any distinctive woody flora various small trees and shrubs of somewhat xerophytic habit have invaded the barrens: *Celtis pumila* var. *georgiana*, *Crataegus apiifolia*, *C. thermopegaea*, *Vaccinium arboreum*, *Diospyros virginiana*, *Bumelia lanuginosa* and stunted specimens of *Ulmus alata* and *Quercus marilandica* are amongst those most frequently present.

The dominant type of forest and its included herbaceous flora in the Hot Springs area may then be regarded as typical of the Western phase of the Carolinian flora, which has extended over the Ozark region from the south, succeeding the prairie and steppe conditions that followed the last retreat of the glaciers, of which such abundant evidence still remains in the prairies and barrens of the Ozark plateau. A few species of southwestern origin have found their way here, as to other parts of the region: Amongst them may be enumerated *Prunus mexicana*, *P. Reverchoni*, *Andrachne phyllanthoides*, *Yucca glauca*, *Celtis laevigata* var. *texana*, *Vitis Linsecomi* var. *glauca* and *Cissus incisa*. Some of these are perhaps rather southern than southwestern, but a number of others amongst herbaceous species undoubtedly have their center of distribution in the latter quarter.

At least 30 species on the appended list, or 15 per cent of the total, belong to the Coastal Plain province and the southern or humid phase

of the Carolinian flora, although a few of them extend far north along the Atlantic seaboard and inland to the shores of the old Mississippi embayment. Most conspicuous amongst these are *Pinus Taeda*, *Myrica cerifera*, *Smilax lancifolia*, *Quercus nigra*, *Planera aquatica*, *Hamamelis macrophylla*, *Crataegus spathulata*, *C. apiifolia*, *Rubus rubrisetus*, *Xanthoxylum Clava-Herculis*, *Ilex opaca*, *I. vomitoria*, *Acer leucoderme*, *Aesculus discolor* var. *mollis*, *Vitis rotundifolia*, *Aralia spinosa*, *Rhododendron oblongifolium*, *Xolisma mariana*, *Vaccinium corymbosum*, *V. virgatum*, *Bignonia capreolata* and *Viburnum nudum*. While some of the herbaceous plants found in the area are also from this source they are probably relatively less abundant. In view of the geographical position of the Ouachita Mountains, their presence here is not at all surprising, as has been previously mentioned.

Perhaps the most interesting feature of the ligneous flora is the occurrence of a number of plants, which, judging by their present distribution, appear to have originated in and been dispersed from the Southern Appalachian region of the Southeastern States. Most of these are by no means confined to the Hot Springs area, but are in many cases found both farther north, in the Boston Mountains, and westward to the Kaimichi Mountains of Oklahoma. They are, however, in most cases, comparatively rare or local in this region, and some of them are found only in certain localities affording the protection of high north-facing bluffs or other exceptionally favorable conditions. To this class belong *Magnolia tripetala*, *Philadelphus pubescens*, *Crataegus straminea*, *C. regalis*, *C. Mohri*, *Robinia Pseudoacacia*, *Amorpha nitens*, *Ilex caroliniana*, *Styrax grandifolia*, *Halesia monticola* var. *vestita* and *Rhododendron canescens*.

The Mississippi River, with its wide flood plains and extensive areas of lowlands and swamp, completely occupied as they are by a dense flora of a different character, offers at present such an effective barrier between the two regions as to preclude any probability of direct migration of mountain species between them, and when we consider the antiquity of this barrier, the probability becomes even more remote. How then are we to account for the presence here of these woody plants, as well as many herbaceous species, from the Appalachian region? The most plausible hypothesis seems to be that preceding the last incursion of the glaciers, perhaps during an interglacial period, this flora extended westward along the highlands to the north of the Mississippi embayment, and that some of its plants were pushed southward, on both sides of the present valley.

PINACEAE

Pinus echinata Mill. The Short-leaf or Yellow Pine is still one of the commoner forest trees on some parts of the area, growing on rocky uplands and mountain slopes. Formerly, it was much more abundant and furnished large quantities of logs to the numerous saw mills that operated in Hot Springs and vicinity. Some good specimens are still to be seen in the National Park, where fortunately they will be preserved.

Pinus Taeda L. The Old-field Pine, sometimes called Long-leaf Pine

in this section, is a species of the Coastal Plain, which has invaded the Hot Springs area along the stream valleys. It is not rare but much less common than the last.

Juniperus virginiana L. The Red Cedar is found in many places along rocky streams and mountain sides, but is nowhere very common or of large size.

GRAMINEAE

Arundinaria macrosperma Michx. The Small Cane is found along the Ouachita River valley and in the protection of bluffs along the smaller streams. It seldom attains here a height of more than one or one and a half meters.

LILIACEAE

Yucca glauca Nutt. This scarcely woody Yucca, sometimes called Bear Grass, attains a maximum height of about one meter. It was found in several places along the rocky bluffs of the Ouachita River.

Smilax glauca Walt. The various species of Smilax are popularly called Green-briar, Saw-briar or Cat-briar, and are scarcely distinguished by the country people, although well marked in botanical characters. This slender trailing or climbing species is common in open rocky or alluvial ground along streams.

Smilax hispida Muhl. A high climbing vine in moist or alluvial ground along streams. The larger stems are thickly set with prickles.

Smilax Bona-nox L. This species, with stout short thorns, grows usually in dry rocky or gravelly open ground along streams.

Smilax rotundifolia L. In moist fertile ground, climbing on trees and shrubs.

Smilax lancifolia L. This species was collected in the valley of the Ouachita River. It may be looked for also in small sandy bogs along the mountain creeks.

SALICACEAE

Populus balsamifera var. *virginiana* (Foug.) Sarg. The Cottonwood is found in the Ouachita River valley and occasionally along some of the smaller streams.

Salix nigra Marsh. The Black Willow is found along all of the perennial streams, but is commonest in the valley of the Ouachita River. Some tall specimens here and on Hot Springs Creek may represent the var. *altissima* Sarg.

Salix longipes var. *Wardii* (Bebb) Schneider. The Gray or Ward's Willow is a common and characteristic shrub or small tree along the rocky or gravelly margins of the larger streams. It is particularly abundant on the rocky flood plains and banks of the Ouachita River, near the mouth of Hot Springs Creek.

Salix humilis Marsh. This low shrubby Willow, which is characteristic of more open regions, appears to be rather rare here, having been noted only near High Point and at one other place.

MYRICACEAE

Myrica cerifera L. The Wax Myrtle, a southern shrub of the coastal Plain, is growing here in small sandy bogs along the upper courses of several of the spring-fed tributaries of Gulpha Creek. A few specimens were also seen near the mouth of Hot Springs Creek.

JUGLANDACEAE

Juglans nigra L. Black Walnut. Found sparingly in the valley of the Ouachita River and along the larger creeks.

Carya ovata (Mill.) K. Koch. The Shag-bark Hickory is rare in the Hot Springs area, apparently being confined to the valley of the Ouachita River, where a few specimens were seen.

Carya alba (L.) K. Koch. Mocker-nut, Bull Hickory. This is a rather common tree in dry upland woods and also in the rocky creek valleys. The nuts are gathered by the country people and are sometimes sold on the market. They are very variable in shape and size.

Carya Buckleyi var. *arkansana* Sarg. This southwestern species grows in similar situations to the last, and is more abundant, being the commonest Hickory of the region. Like the other species, the wood is much sought for tool handles, wagon material and other uses.

Carya Buckleyi var. *villosa* (Ashe) Sarg. This form, with pubescent leaves and young branchlets, is sometimes found on dry rocky ridges and mountain slopes.

Carya ovalis var. *obovalis* Sarg. This is also a species of dry rocky ground. It apparently is not common here, its principal range being to the north and east.

Carya leiodermis Sarg. This southern Hickory has recently been found in the Hot Springs area, and at several other stations in southern Arkansas.

Carya cordiformis (Wangh.) K. Koch. This tree is known throughout the South and Middle-west as Pignut, on account of the bitter inedible nuts, which, however, are eaten by swine and wild animals.

Carya aquatica (Michx. f.) Nutt. The Swamp Hickory, as its name indicates, is usually a denizen of deep swamps or wet alluvial bottoms, but along the Ouachita River, it has, with several other swamp species, adapted itself to a very unusual environment, growing on the low rocky banks and on bars and islands covered with coarse shingle and rubble, which are often flooded by rises of the stream.

BETULACEAE

Betula nigra L. The River Birch was seen only along the banks of the Ouachita River.

Carpinus caroliniana Walt. Ironwood, Blue Beech. This small tree is common in places in the rocky flood plains of the larger creeks and along the Ouachita River.

Ostrya virginiana (Mill.) Willd. Ironwood, Hop-hornbeam. This species often grows with the last but it is also sometimes found in dryer situations and on the mountain sides.

Alnus rugosa (Du Roi) K. Koch. This shrubby Alder has a wide range, extending from New England to Minnesota and along the coastal plain to Eastern Texas. In the Hot Springs area it is found frequently along the margins of rocky streams.

Corylus americana Walt. The Hazelnut is a northern shrub, and reaches almost its southwestern limit of range here. It is found in thickets along some of the streams, but is rather rare.

FAGACEAE

Castanea ozarkensis Ashe. Ozark Chinquapin. This species, which is often arborescent, is rather common on the high rocky slopes of some of the mountains.

Quercus alba L. The White Oak is a common and characteristic tree of the upland woods, and it also grows along streams where the soil is well drained. It usually attains only a moderate size here, and as it is one of the most valuable hardwood timber trees, most of the larger specimens, outside of the National Park, have been cut down to supply the saw mills.

Quercus alba var. *latiloba* Sarg. This variety, with broad-lobed leaves is about as common as the typical form.

Quercus stellata Wagh. The Post Oak is a very common medium-sized tree of the rocky upland woods. The wood is used for fuel and railroad ties.

Quercus stellata var. *araneosa* Sarg. A group of small trees of this well marked variety was found on a rocky hillside near the Ouachita River, and it probably occurs elsewhere.

Quercus Muhlenbergii Engelm. Chinquapin Oak, Yellow Oak. This tree shows a decided preference for limestone regions and alkaline or neutral soils, and it is comparatively rare in the Hot Springs area. A few specimens were noted in the rocky valley of Gulpha Creek and also about half-way down the valley of Hot Springs Creek.

Quercus borealis var. *maxima* Ashe. The Northern Red Oak is found on rocky slopes and is abundant on some of the mountain sides, especially near the summits.

Quercus Shumardii var. *Schneckii* (Britton) Sarg. Red Oak. This species is scarcely distinguished from the last by woodsmen and farmers. It is a common tree in most of the Ozark region, but appears to be rather rare here, only a few specimens having been found in the creek valleys.

Quercus velutina Lam. The Black Oak is a common tree throughout the area in rocky upland woods.

Quercus velutina var. *missouriensis* Sarg. This variety, with more pubescent and thicker leaves, is found on rocky mountain slopes.

Quercus marilandica Muench. The Black Jack Oak is found in the dryer and more sterile parts of the rocky woods, where it is often very common. It is a small sized tree and the wood is usually of inferior quality.

Quercus rubra L. Red Oak, Spotted Oak. This tree is common in the

rocky valleys and on the lower hills. The leaves are pale and tomentose and vary greatly in size and lobing.

Quercus Phellos L. This species, which usually grows on low alluvial lands, is comparatively scarce in the Hot Springs area. It is occasionally found, however, along all of the small streams and in the valley of the Ouachita River.

Quercus nigra L. The Water Oak, which is more commonly called Pin Oak in the South, is distinctly a lowland species, and it is one of the rarest Oaks in the Hot Springs area. Besides growing on alluvial lands along the Ouachita River, a few specimens were found in the upper part of the valley of Hot Springs Creek, where it has apparently hybridized with other species, as recorded below.

× *Quercus garlandensis*, hyb. nov. (*Q. nigra* × *rubra*). Three trees which appear to be this hybrid were found in the upper part of the valley of Hot Springs Creek. The first, following the course of the creek, is a slender symmetrical tree about 18 meters tall and with a trunk 4 decimeters in diameter. The bark is comparatively smooth, and somewhat mottled on the branches, resembling that of *Q. nigra*; the branches are slender, the lower one horizontal or slightly drooping; leaves variously lobed and often unsymmetrical, stellate pubescent on both sides when young, becoming glabrate in age except for prominent tufts of tomentum in the axils of the veins on lower surface; fruit sessile or nearly so, short ovoid, the nuts 12–14 mm. long and 10–12 mm. in diameter, pubescent at the apex, enclosed only at the base in the shallow cups, which are 12–15 mm. in diameter and 4–5 mm. in height, flattened, rounded or slightly turbinate at the base, and with rather loose slightly puberulent scales. The second tree is about 30 meters down the stream and close to its bank. It is slightly smaller but quite similar. The third is about 150 meters down the stream and on the opposite or left bank. It is a smaller tree, only about 10 meters in height. These trees have been under observation for three seasons and their identity has been quite puzzling; at one time I thought they might be referable to *Q. georgiana* Curtis, to which in foliage and fruit they are somewhat similar. The two larger trees have fruited abundantly, and an attempt is being made to grow them both from grafts and seeds at the Arnold Arboretum. *Quercus rubra* is rather common in the vicinity of these trees, and there is a large tree of *Q. nigra* about 100 meters up the stream from the first tree, and a few smaller specimens are found near. My specimens, numbers 23139 and 24238, from the first tree described, may be taken as typical.

Quercus nigra × *velutina*? A small tree, 6 or 7 meters tall and with a trunk diameter of about 2 decimeters, growing in a group of larger trees in the rocky valley of Hot Springs Creek, about one mile south of the National Park, appears to represent this hybrid. The fruit was not seen, and this somewhat doubtful determination is based on the characters of the leaves, buds and branchlets, which appear to be intermediate between the two

species indicated, both of which are growing nearby. There is no doubt that the tree is a hybrid, but better material is needed for definite determination.

Quercus Phellos \times *velutina*. A single specimen of this hybrid was found in 1925 along a tributary of Gulpha Creek, about a mile east of the city of Hot Springs. The tree is about 15 m. tall and was fruiting abundantly. Both supposed parent species are growing close by.

\times *Quercus incomita*, *hyb. nov.* (*Q. marilandica* \times *rubra*). A single tree believed to be a hybrid between the Black Jack and Southern Red Oak was found at the edge of the rocky valley of a small tributary of Gulpha Creek, about a mile and a half east of Hot Springs. The tree is about 12-14 m. tall, with stout branches and branchlets. The bark is moderately rough and furrowed, resembling that of *Q. rubra*. Leaves obovate in outline, narrowed and rounded or subcordate at base, with shallow sinuses and one to three pairs of ascending, bristle-tipped lobes; texture firm and slightly stellate-pubescent beneath. Fruit short-stalked; nut oblong or short-cylindric, 14-16 mm. long, 8-12 mm. in diameter, one-third to one-half enclosed in the rounded or turbinate cup, which is about 10 mm. deep and 12-15 mm. in diameter, with rather loose puberulent scales and thin fringed margin. In leaf form and habit of growth this tree resembles more closely forms of *Q. rubra*, while in the fruit characters and its stout branchlets and large pubescent buds the resemblance is closer to *Q. marilandica*. Both supposed parent species are growing in close proximity to it.

ULMACEAE

Ulmus americana L. The White or American Elm grows in open woods along all of the streams, but it is nowhere very common.

Ulmus fulva Michx. The Slippery Elm is apparently rare, one large tree only having been noted in the valley of Hot Springs Creek. This tree had been much injured by the repeated stripping of the bark, presumably by natives for medicinal purposes. No doubt it occurs sparingly at other places in the area.

Ulmus alata Michx. The Winged Elm is the common Elm of the region, and is often abundant along streams and in rocky hillside woods.

Ulmus serotina Sarg. The Southern Red Elm, which is distinguished from the other species by its habit of flowering and fruiting in the autumn, is rather abundant along the rocky bluffs of the Ouachita River, and it was also found on the banks of Gulpha Creek.

Planera aquatica (Walt.) J. F. Gmel. The Planer-tree or Water Elm, like the Swamp Hickory, is normally found in deep swamps, but with that tree it has managed to establish itself along the rocky ledges and bars of the Ouachita River, where it appears to flourish, rooting directly in the shale beds or quartzite rubble, the roots doubtless penetrating to a permanent water supply in the bed of the river as well as being irrigated by frequent floods that sometimes sweep quite over the tops of the trees.

Celtis laevigata Willd. This southern Hackberry is found along streams, and is most abundant in the valley of the Ouachita River.

Celtis laevigata var. *texana* (Scheele) Sarg. This southwestern variety grows in the rocky valleys in somewhat drier situations than the last.

Celtis pumila var. *georgiana* (Small) Sarg. This species is usually a shrub or sometimes a small crooked-branched tree growing in the rocky valleys or on the mountain sides.

MORACEAE

Morus rubra L. The Red Mulberry is found occasionally on the more fertile lands along the streams. It is a small-sized tree here and nowhere very common.

Morus alba L., the White Mulberry of the Old World, has become established in waste ground and along streams, probably from seeds carried by birds from cultivated trees.

Ficus Carrica L., the domestic Fig, was also collected as an escape from cultivation, along Hot Springs Creek.

Machura pomifera (Raf.) Schneider. Osage Orange, Hedge Tree. This tree, which is probably an escape from cultivation here, but which is native in the prairie regions a little to the west, was found growing at several places near Hot Springs.

POLYGONACEAE

Polygonella americana (Fisch. & Mey.) Small. This curious little shrub is locally abundant on shale outcrops in the flood plain of the Ouachita River, near the mouth of Hot Springs Creek. It is distinctly woody, some of the stems being nearly 2 centimeters in diameter, and the maximum height of the plants is about 6 decimeters. I have not been able to learn any local name for this plant. The name Jointweed, given in the books, is not in use here, and is certainly inappropriate, as few plants could with less justice be called weeds.

Brunnichia cirrhosa Banks. This slightly woody climbing vine is a lowland species, and was noticed only in the lower part of the valley of Hot Springs Creek and along the Ouachita River.

LORANTHACEAE

Phoradendron flavescens (Pursh) Nutt. Mistletoe. This well known parasitic shrub is found in the valley of the Ouachita and occasionally along the smaller streams. Its commonest hosts here are the Elms, but it is sometimes found on various other trees.

RANUNCULACEAE

Clematis Simsii Sweet. Leather-flower. This slightly woody climber is found in thickets in the valleys and on open rocky hillsides.

Clematis versicolor Small. This species is similar to the last, differing from it mainly in the plumose styles which tip the seeds. It has been found in sandy soil along the Ouachita River.

ANONACEAE

Asimina triloba (L.) Dunal. The Papaw is found on the more fertile lands in the stream valleys, but it is not very abundant.

MAGNOLIACEAE

Magnolia tripetala L. Umbrella-tree. Perhaps this tree should not be included in the list, as it was not seen strictly within the limits of the general exploration, but it was collected a few miles to the south, in the southern part of Garland County, and it also occurs a few miles north of Hot Springs, if not actually within the area.

MENISPERMACEAE

Menispermum canadense L. Moonseed. This slender woody vine grows in thickets along the creeks and river.

Cocculus carolinus (L.) DC. Fishberry. A trailing or climbing vine, found in thickets along streams and on open rocky hillsides.

Calycocarpum Lyoni (Pursh) Nutt. Cupseed. This barely woody climber was collected in open alluvial ground in the valley of the Ouachita River.

LAURACEAE

Sassafras officinale Nees & Eberm. The Sassafras is found in open rocky ground along streams and is most frequent in rocky abandoned fields.

Benzoin aestivale (L.) Nees. Spice-bush. This shrub is found in moist rich soil along all of the perennial streams. A form with pubescent leaves and branchlets, which is frequent throughout the Ozark region and in several Southern States, is also found here.

SAXIFRAGACEAE

Hydrangea arborescens L. This low shrubby species grows on steep rocky slopes and bluffs with a north or east exposure, where there is rather abundant moisture.

Philadelphus pubescens Loisl. Mock-orange, Syringa. This pretty flowering shrub is growing along the rocky north-facing bluffs of the Ouachita River, and it was also collected along Gulpha Creek, about 4 miles east of Hot Springs.

Itea virginica L. This little shrub is usually found in deep swamps, but in the Hot Springs area it grows amongst wet rocks in spring creeks and in the small sandy bogs.

HAMAMELIDACEAE

Hamamelis macrophylla Pursh. Witch Hazel. This species is similar to *H. virginiana* of the eastern and northern states, but is generally a smaller shrub and never arborescent. It flowers from September to November. It is found along streams and mountain sides.

Hamamelis vernalis Sarg. This is a stout shrub growing in clumps along the gravel bars and rocky margins of all the perennial streams. It flowers in February and March.

Liquidambar styraciflua L. The Sweet Gum is a common tree of large size in the valleys of all of the streams, and is sometimes found on the lower north slopes of the mountains

PLATANACEAE

Platanus occidentalis L. Sycamore. This well known tree is found along the banks of the river and on several of the larger creeks.

ROSACEAE

Amelanchier canadensis (L.) Medic. June-berry. On rocky bluffs and north slopes of the mountains.

CRATAEGUS

CRUS-GALLI GROUP

Crataegus bellica Sarg. Red Haw, Cock-spur Thorn. The name Red Haw, or more rarely Thorn Tree or Thorn Bush, is popularly applied in this part of the country to the various members of this genus, some of which are very distinct from each other in habit, foliage, flowers and fruit, while others are distinguished on only slight botanical differences. This species is a very thorny, intricately branched shrub or small tree, growing in thickets in the rocky valleys.

Crataegus Bushii Sarg. A small tree found in situations similar to the last.

Crataegus Mohrii Beadle. This species ranges from the southern Apalachians to Arkansas, and probably reaches its northwestern limit here.

Crataegus regalis Beadle. This is also a species of the southern States, which apparently is not very common here.

Crataegus Engelmannii Sarg. This and the two following species are somewhat similar to each other and may be distinguished from others of the group found in this area, by having pubescent leaves and flowering corymbs. Like most of the Red Haws it grows in thickets and open woods in the rocky valleys.

Crataegus pilifera Sarg.

Crataegus subpilosa Sarg.

PUNCTATAE GROUP

Crataegus sordida var. *villosa* Sarg. A small tree with spreading branches and round or flat top. It differs from most of the others also in being almost thornless. It is comparatively rare here.

VIRIDES GROUP

Crataegus viridis L. Green Haw, Bird Haw. This is a small tree, but becoming larger than most of the other species. The bark is flaky in thin scales, and the abundant fruit is of small size. It is widely distributed in the southern states, and usually inhabits wet alluvial bottom lands. It is rather abundant in the Hot Springs area, growing in the more fertile parts of the valleys.

Crataegus blanda Sarg. This species differs from the last mainly in its rougher dark bark. It grows often in dryer situations.

UNIFLORAE GROUP

Crataegus trianthophora Sarg. This little shrub, seldom more than 5 to 6 decimeters in height, was seen only on the rocky banks of the Ouachita River, near Lawrence.

PRUINOSAE GROUP

Crataegus seclusa Sarg. A very thorny shrub or small tree, found in thickets and openings in rocky woods. The fruit is hard and remains green until late in the season.

INTRICATAE GROUP

Crataegus Harveyana Sarg. This is a very thorny intricately branched shrub, 1 to 2 meters in height. It is found in thickets on rocky hillsides and along the small streams.

Crataegus straminea Beadle. A shrub similar to the last, but distinguished by its thinner, nearly glabrous leaves and its flowering. It is more abundant than the last and often grows in large patches.

Crataegus padifolia var. *incarnata* Sarg. This Thorn sometimes becomes a small tree, but is more often shrubby, as were the specimens seen here.

Crataegus ouachitensis, sp. nov.¹ Growing rather sparingly in thickets along the rocky creek valleys and on open hillsides, about Hot Springs.

Shrub or small tree 4-6 m. tall, with slender ascending branches and dark gray bark, smooth on the branches and becoming scaly on old trunks; abundantly armed with moderately stout dark purplish straight or slightly curved spines 2-4 cm. long; branchlets glabrous, at first olive-brown, becoming gray. Leaves ovate or deltoid in outline, 2-4 cm. long and about as wide, sharply and deeply serrate with narrow acuminate teeth, and with one to three pairs of usually obscure lobes, acute or abruptly pointed at the apex, rounded or abruptly contracted at the base, tapering into the very slender 1.5-2.5 cm. long petioles; glabrous at flowering time or with a few villous hairs on the upper surface and on the petioles; those on vigorous shoots sometimes larger, truncate or subcordate at base and more deeply lobed. Flowers 1.5-2 cm. in diameter, in few-flowered (3-8 in specimens examined) corymbs; pedicels slender, 1-2 cm. long; calyx-lobes lanceolate, serrate or laciniate; stamens about 20; anthers rose color or rose-purple; styles 3-4. Fruit on specimens examined obovoid or pyriform, 7-10 mm. long, 7-8 mm. thick, remaining hard and green until late in the season, and finally flushed with red; calyx broad and prominent, with short tube and persistent lobes; nutlets 3-4, with shallow grooves and broad ridges on the dorsal surface, flattened or slightly concave ventrally, and with distinct hypostyle.

This species is perhaps most closely related to *Crataegus seclusa* Sarg.

¹ *Crataegus ouachitensis*, sp. nov. Frutex vel arbor minor, circa 4-6 m. altus; rami erecti vel ascendentes; ramuli annotini fusco-virides, biennes cinerascens; cortex sulcato-squamosus; spinæ satis robustæ, atropurpureæ. Folia ovata vel deltoidea, 2-4 cm. longa, circiter 2-4 cm. lata, obscuræ lobata, margine graciliter inciso-serrata, apice breviter acuta, basi rotundata vel subito in petiolum gracillimum 1.5-2.5 cm. longum contracta; juvenilia glabrescentia vel leviter villosa; ramulorum sterilius majora, ad 3-4 cm. longa lataque, profunde incisa, basi truncata vel subcordata. Flores 1.5-2 cm. lati, pauci (in speciminibus visis 3-8), in corymbis glabrescentibus vel leviter pilosis; pedicelli graciles 1-2 cm. longi; stamina circa 20; antheræ roseæ vel roseo-purpureæ; styli 3-4. Fructus obovato-oblongus vel pyriformis, circa 7-10 longus, 7-8 mm. crassus, firmus, viridis, deinde rubescens; calyx latus, tubo brevi; sepala lanceolata, serrata.

from which it differs in its small, sometimes slightly villous leaves, which are more deeply serrate, and especially in the size and shape of the fruit and nutlets. The fruit most closely resembles that of *C. vicinialis* Beadle in its shape and size, but differs from it in color and in its dryer and harder flesh; the foliage is also quite different from that species.

Type specimens are my numbers 24477, April 22, 1924, for flowers and 26459, Oct. 9, 1924, for fruit, both from the same plant. Number 29083, Oct. 10, 1925, from another tree, also belongs to this species.

Crataegus ouachitensis var. *minor*, var. nov.¹ This variety differs from the type in its smaller, relatively shorter leaves, which are sometimes broader than long, varying from short-ovate to broadly rhombic or elliptic in outline, less lobed, more deeply and finely serrate, and more copiously pubescent on the veins and on the extremely slender (2.5–3.5 cm. long) petioles, in the villous flowering corymbs and subglobose or slightly oblong fruit.

In appearance and habit this plant is so distinct and striking that when first found in flower I was inclined to regard it as a hybrid between *C. apiifolia* and the above species, a suspicion, however, that was not confirmed by the mature fruit. Although differing considerably in appearance it seems clearly to be related to *C. ouachitensis*, and is perhaps best regarded as a variety of that species.

Type specimens are my numbers 24499, April 23, 1924, for flowers, and 29095, Oct. 10, 1925, for fruit, both coming from the same plant. Number 26848, April 21, 1925, is also from this shrub, and number 29177, Oct. 13, 1925, from a small specimen at a different locality, also belongs here. The specimens seen were spiny shrubs 2–3.5 m. tall, growing on rocky banks along a branch of Gulpha Creek.

MICROCARPAE GROUP

Crataegus spathulata Michx. This very distinct southern species is rather common in the Hot Springs area, growing in rocky valleys and sometimes on the mountain slopes. Like the other members of the group it has small bright red fruit, usually very abundant and showy.

Crataegus apiifolia (Marsh.) Michx. Parsley Haw. This species resembles the last in habit and in its thin flaky bark, but is well distinguished by its small round or ovate, deeply incised leaves and its much earlier flowering.

MACRACANTHAE GROUP

Crataegus thermopogaea, sp. nov. An² intricately branched very spiny

¹ *Crataegus ouachitensis* var. *minor*, var. nov. A typo recedit habitu minore dense ramoso, foliis minoribus, saepe brevioribus quam longis, magis inciso-serratis, copiose pubescentibus, corymbis pilosis et fructibus oblongis vel subglobosis.

² *Crataegus thermopogaea*, sp. nov. Frutex dense ramosus ad 1–1.5 m. altus, spinis crebris gracilibus 2–4 cm. longis. Folia matura papyracea sed firma, ovata, obsolete lobata, 2.5–4 cm. longa, 2–4 cm. lata, margine serrata vel biserrata dentibus parvis acuminatis, apice acuta vel breviter acuminata, basi cuneata, sensim in petiolum 1–2 cm. longum contracta, superne adpresse-villosa, subtus hirsuta praesertim ad venas; ramulorum steriliū ad 5–6 cm. longa, basi rotunda vel truncata. Flores pauci, in

shrub, 1-1.5 m. tall, growing in thickets on rocky banks and along small upland streams in the vicinity of Hot Springs.

Leaves ovate in outline, obscurely lobed and sharply serrate with broad acuminate teeth, acute or slightly acuminate at the apex, appressed-villous above and hirsute on the lower surface with short pale hairs, thin but firm at maturity, 2.5-4 cm. long, 2-3 cm. broad, or larger on vigorous shoots, where the base is also sometimes truncate or subcordate. Flowers opening very late in the season (seen only in bud April 21st), in few-flowered compact densely villous corymbs, with glandular deciduous bracts and serrate calyx lobes; stamens 10? or more; anthers deep red in bud. Fruit subglobose, 6-10 mm. in diameter, with small nearly sessile calyx and erect or spreading calyx-lobes, which are usually deciduous from the ripe fruit, bright scarlet, with yellow flesh, becoming succulent when mature; nutlets 2-3, broad and rounded at the ends, broadly ridged on the dorsal and shallowly pitted on the ventral surface.

This species differs strikingly in habit and general appearance from any other member of the group with which I am acquainted, resembling more some of the *Intricatae*, to which group I was inclined to assign it before examining the ripe fruit and nutlets.

Type specimens are my numbers 26845 (in bud), April 21, 1925, and 29085, October 10, 1925, with mature fruit. Other collections are numbers 26703 and 26704, October 11, 1924. A specimen collected in flower by J. H. Kellogg, number 19, Baker Springs, Howard Co., Ark., April 20, 1909, may also belong here. The stamens of this plant as recorded on the specimen are 20; anthers rose-color; styles 2-3.

Rubus Andrewsianus Blanchard. This is the common tall Blackberry of the region. It is found here in thickets and clearings, but is not so common as in more open sections.

Rubus villosus Ait. This thorny Dewberry is found on rocky mountain slopes and in open ground along the creek valleys.

Rubus rubrisetus Rydb. A southern species found in sandy ground along the Ouachita River and on railway embankments near Hot Springs. The fruit ripens earlier than that of the other species. The stems are thickly covered with red bristles.

Another species of Blackberry, which may be *Rubus probabilis*, Bailey, was found in open rocky ground along Gulpha Creek, but the material is not complete enough for definite determination.

Rubus thyrsoides Wimmer, a European species, sometimes cultivated, was collected as an escape along Hot Springs Creek.

Rosa setigera var. *tomentosa* T. & G. Prairie Rose. This tall somewhat climbing species is found in thickets along the stream valleys.

Rosa subserrulata Rydb. This low growing species, with very spiny corymbis dense villosis compactis; stamina 10 vel plura; antherae rubicundae, bractae glandulosae, deciduae. Fructus subglobosus, 6-10 mm. diam., intense scarlatinus pulpa succulenta matura flava; calyx parvus, fere sessilis; sepala serrata, fructu maturo decidua.

and bristly stems, is often abundant in rocky ground on the mountains and in glades.

Rosa carolina L. A widely distributed low Rose, found in open woods, but not very common here.

Rosa Lyoni Pursh. This species differs from the last principally in its pubescent foliage, and it is much commoner in the Hot Springs area.

Prunus serotina Ehrh. The Wild Cherry is found in the valleys and on some of the rocky mountain slopes, where it is often abundant.

Prunus lanata (?) (Sudw.) Mack. & Bush. This is the commonest wild Plum of the Ozark region. It sometimes becomes a small tree 6 to 8 meters tall. It differs from the more widely distributed *Prunus americana* Marsh., in its pubescent foliage. It is common in the Hot Springs area, growing in the rocky valleys and on the mountain sides. This is the plant that was once described by Professor Sargent as *Prunus arkansana*, and there is some doubt in the writer's mind as to whether it is identical with the above species, to which it has been more recently referred.

Prunus mexicana Wats. Big Tree Plum. This southwestern species is found in situations similar to the last. It sometimes becomes a larger tree and the leaves are also larger and rugosely veined.

Prunus americana Marsh. This species is mainly of more northern range, and it is apparently not very abundant in the Hot Springs area.

Prunus Munsoniana Wight & Hedrick. This shrubby or sometimes arborescent plum is most abundant in the prairie regions to the west and south, and it may be a recent introduction here, where it is not common.

Prunus Reverchonii Sarg. This southwestern species, hitherto known only from Texas and Oklahoma, was collected in a thicket along a small rocky stream near Hot Springs. It is a shrub seldom more than 1 or 2 meters tall.

LEGUMINOSAE

Cercis canadensis L. The Redbud is found in the rocky valleys and on the mountains, where it is often abundant. The deep pink or magenta flowers make it a beautiful feature of the early spring woods.

Gleditsia triacanthos L. The Honey Locust is found in woods along the stream valleys, but is not very common here.

Gymnocladus dioica (L.) K. Koch. Kentucky Coffee-tree. This tree was seen only along the rocky bluffs of the Ouachita River, near Lawrence. Although it may occur elsewhere it is probably rare in the area.

Robinia pseudoacacia L. Black or Kentucky Locust. Found rather abundantly on some of the rocky mountain slopes, where it is undoubtedly native.

Amorpha fruticosa L. False Indigo. This shrub grows along the margins of pools on the Ouachita River and some of the larger creeks.

Amorpha tennesseensis Shuttl. This species, which is quite similar to the last, was found along the Ouachita River.

Amorpha glabra Desf. On dry rocky banks and mountain slopes.

Amorpha croceolanata Wats. A tall shrub, much larger than any of the other species growing in the region, some specimens being two meters or more in height. It is abundant along rocky ravines and on some of the mountain slopes. This species appears to be well marked and distinct, and I see no reason why it should be regarded as a variety of *A. fruticosa*, as Schneider has proposed.

Amorpha nitens Boynton. This is a slender shrub, as found here, seldom over one meter in height. It grows in frequently flooded but rocky ground along the margins of Hot Springs Creek and the Ouachita River. I was at first inclined to regard this as an undescribed species, but careful examination fails to show any good characters to distinguish it from this southeastern species, which is not known to have been previously found west of the Mississippi River. The foliage of this plant turns black in drying.

Wistaria macrostachya T. & G. This handsome flowering vine was found in the valley of the Ouachita River, in rocky ground subject to overflow.

RUTACEAE

Zanthoxylum americanum Mill. A small thicket of this northern Prickly Ash was found in open rocky woods along Gulpha Creek, near Hot Springs. It is apparently rare in this area.

Zanthoxylum Clava-Herculis L. Tooth-ache Tree. This small tree is a species of the coastal plain, and was noted here only near the Ouachita River in the vicinity of Lawrence.

Ptelea trifoliata L. The Wafer Ash or Hop Tree is found on rocky open hillsides and along streams. It is abundant on the banks of the Ouachita River.

Poncirus trifoliata Raf., the Wild Orange, was noted growing wild and fruiting in the National Park and in the environs of Hot Springs.

EUPHORBIACEAE

Andrachne phyllanthoides (Nutt.) Muell. Arg. This curious little shrub, sometimes called Buck-brush by the country people, is a native of Texas and a few scattered localities in the Ozark region. It is found in the Hot Springs area growing on rock outcrops in the beds of creeks and along the Ouachita River. It is most abundant on shale banks in the flood-plains of the river. The foliage is eagerly eaten by stock and is usually kept cropped down where it is accessible.

ANACARDIACEAE

Rhus canadensis Marsh. Fragrant Sumac, Coffee-berry. This slender shrub is often common on rocky banks and in open glades.

Rhus copallina L. This small tree or shrub, in common with the next species, is called Sumac or Shoemake, and the two are scarcely distinguished by the country people, although well marked botanically. It grows in thickets and rocky open ground along the streams.

Rhus glabra L. This species grows in situations similar to the last, but is perhaps less common.

Rhus Toxicodendron L. Poison Ivy, Poison Oak. This shrub, or sometimes scandent vine, is well known for the supposed poisonous character of its leaves. Persons with tender skins should beware of it, although many, like the writer, seem to be ordinarily immune to it.

Rhus quercifolia (Michx.) Steud. This small species is seldom over three to five decimeters in height. The leaves have the same irritating or poisonous quality as in the last named plant.

AQUIFOLIACEAE

Ilex opaca Ait. Holly, Christmas Holly. Found occasionally in the valleys and on steep hillsides. It is usually only a shrub in this area, with a maximum height of four or five meters.

Ilex decidua Walt. Bearberry, Henberry. Rather common in thickets, especially in the flood plains of the Ouachita River and the larger creeks.

Ilex caroliniana (Walt.) Trel. This low shrubby species is often common on steep mountain slopes and rocky banks of streams.

Ilex vomitoria Ait. This species is a native of the coastal plain, and apparently reaches its northern limit in the Mississippi valley here. It is found sparingly along the rocky banks of Hot Springs Creek and the Ouachita River. It is a tall shrub, sometimes five or six meters high. In the South it is known as Youpon or Yaupon.

CELASTRACEAE

Evonymus americanus L. Strawberry Bush. This slender shrub, which is very showy in autumn on account of its scarlet and carmine fruit, is abundant in moist sandy ground and on protected banks in the stream valleys and mountain canyons.

HIPPOCASTANACEAE

Aesculus discolor var. *mollis* Sarg. Red-flowered Buckeye. A shrub of the coastal plain, noted here only in the valley of Gulpha Creek, where it is not very abundant.

STAPHYLEACEAE

Staphylea trifolia L. Bladdernut. A northern shrub, found rarely in canyons or on cold north mountain slopes.

ACERACEAE

Acer saccharinum L. Silver Maple, Soft Maple. This tree grows abundantly on the banks of the Ouachita River, and a few small specimens were noted in the valley of Hot Springs Creek, but it is probably escaped from cultivation in the latter place.

Acer rubrum L. The typical Red Maple is occasionally found in the valleys or on the lower mountain slopes, but it is much less common than the variety below.

Acer rubrum var. *tridens* Wood. This variety, distinguished from the typical form by its smaller three-lobed leaves, is abundant along all of

the mountain streams, and in autumn forms a conspicuous feature of the landscape on account of its brightly colored foliage. The leaves here, however, in almost all cases turn yellow or orange instead of the usual crimson color which has given the popular name to the tree.

Acer leucoderme Small. Hard Maple. This southern species is found along rocky bluffs and ravines of the various branches of Gulpha Creek, and in some protected situations it has descended into the valleys. It is often a shrub only three or four meters in height, but in the more fertile soils it sometimes becomes a small tree up to ten meters tall, with crooked much branched stems and pale bark. This station is farther north than any previously known for the species. The leaves of many of the trees here are nearly glabrous, at least when mature, and this character made me at first suspect that they might be specifically distinct, but examination of a series of specimens from Georgia, Alabama and Tennessee shows a number of them nearly approaching the Arkansas specimens in this respect. In Small's description of *Acer leucoderme* it is stated that the leaves are velvety to the touch on the under surface. This character cannot be regarded as constant if this glabrous form is to be included with the species, as I have thought best to do. However, the species is well distinguished from all others of the Sugar Maple group by its small, relatively broad leaves, usually with three entire lobes, of the same yellow-green color on both sides, and by its crooked branching habit and pale yellowish bark.

RHAMNACEAE

Rhamnus caroliniana Walt. Indian Cherry. Found in thickets along Gulpha Creek, but not common.

Berchemia scandens (Hill) Trel. Rattan Vine, Supple Jack. This stout twining vine is rather abundant in thickets on hillsides and along streams.

Ceanothus americanus L. New Jersey Tea. This small flowering shrub is very common in the National Park and in open rocky woods throughout the area. The leaves are generally narrower and smaller here than in the typical plant farther east.

VITACEAE

Vitis cordiformis Michx. Winter grape, Bird Grape. Common in woods and thickets along streams and sometimes on the rocky mountains.

Vitis palmata Vahl. Growing abundantly in the rocky flood plains of the Ouachita River. It is a high climber in trees and over bushes.

Vitis rupestris Scheele. This species is a low trailing shrub or sometimes slightly viny, but scarcely climbing. It is known as Sand Grape, or sometimes as Sugar Grape from the sweet fruit. It is found here along the rocky flood plains of the Ouachita River.

Vitis Linsecomii var. *glauca* Munson. Post Oak Grape, Summer Grape. This is common in dry rocky woods throughout most of the Ozark region. It is fairly frequent here in such situations and on the mountains, where

it sometimes climbs over bushes or into small trees, or oftener is trailing over rocks. It may be known by its very large leaves, whitish beneath, its purple branchlets and the large, usually flattened berries, which are sweetish but somewhat astringent.

Vitis Lecontiana House. This species is found in situations similar to the last, which it somewhat resembles, but it is a taller climber, and the flowers appear and fruit is ripened later; the berries are also smaller and spherical.

Vitis cinerea Engelm. Winter Grape. Found in thickets and moist or alluvial ground along streams, but not very abundant.

Vitis rotundifolia Michx. Muscadine. This vine, well known for its large sweet fruit, is sometimes found here on the mountains, but is most abundant in sandy or gravelly soil along streams.

Parthenocissus quinquefolia (L.) Planch. Virginia Creeper. Found in thickets and woods, especially along streams.

Parthenocissus quinquefolia var. *hirsuta* Planch. This variety, with pubescent foliage, often grows in dryer situations than the last, and is perhaps more common.

Cissus incisa Desmoul. A trailing vine with thick succulent leaves, growing along rocky ledges and bluffs with south or west exposures. It was found here along the Ouachita River near Lawrence.

Ampelopsis cordata Michx. False Grape. This vine was seen in a few places along streams, but is not common.

Ampelopsis arborea (L.) Koehne. Pepper Vine. Found in thickets and moist ground along streams.

TILIACEAE

Tilia floridana Small. Linden. This tree is rather frequent in the valleys and is also sometimes found on the mountains, especially on the north slopes.

Tilia caroliniana Walt. A few trees of this southeastern species were found in the valley of Hot Springs Creek and along the Ouachita River.

GUTTIFERAE

Ascyrum hypericoides L. St. Andrew's Cross. This diminutive shrub which gets its popular name from the arrangement of the four narrow petals of the flowers, is often abundant in dry rocky woods and on mountain slopes.

Ascyrum stans Michx. Found in sandy bogs and in moist sandy soil along the streams.

Hypericum prolificum L. Shrubby St. John's Wort. Often abundant in gravelly or rocky ground along streams, especially so in the flood plains of the Ouachita River.

Hypericum cistifolium Lam. This small barely woody species is found in rocky or gravelly ground along the borders of streams, it is abundant in the rocky flood plains of the Ouachita River, near the mouth of Hot Springs Creek.

Hypericum adpressum Bart. This little shrub was also found along the Ouachita River, in rocky ground subject to overflow.

CACTACEAE

Opuntia humifusa Raf. This small Prickly Pear is abundant in many localities, on shale outcrops.

Opuntia sp.? Found growing from clefts of trap-rock, along dry exposed bluffs. The narrow flattened joints are sometimes two decimeters in length and are nearly or quite spineless.

NYSSACEAE

Nyssa sylvatica Marsh. Black Gum. This is a common forest tree in the stream valleys and in places on the mountains.

ARALIACEAE

Aralia spinosa L. Tear-blanket, Devil's Club. This slender spiny tree is found along the borders of small sandy bogs or in coves on the mountain sides.

CORNACEAE

Cornus florida L. Flowering Dogwood. This small tree, so well known for its showy flowers appearing in early spring, is common here in open rocky woods, both in the valleys and on the mountains.

Cornus racemosa Lam. This is a tall shrub, sometimes three or four meters in height. The flowers are small and borne in large panicles, and resemble superficially those of the Black Haw. It grows in the Hot Springs area in moist ground along the creeks, where it is often abundant. By the country people it is scarcely distinguished from the next species, both of them being known as Dogwood.

Cornus asperifolia Michx. This species somewhat resembles the last, but the leaves are hirsute and harsh to the touch. Although the collections show no specimen taken within the area of this survey, it has been found in the County at no great distance, and as it is the commonest Cornel of the region there can be little doubt that it occurs here.

ERICACEAE

Rhododendron roseum (Loisel.) Rehd. Azalea, Honeysuckle. This handsome flowering shrub is found in deep rocky ravines and on steep north slopes of the mountains. The flowers, appearing before the leaves, are of a beautiful rose-pink color, and are larger than in the next two species. They are gathered in large quantities by the natives and offered for sale on the streets and at the hotels to the spring tourists.

Rhododendron canescens (Michx.) Sweet. This species grows in similar situations to the last. The smaller, paler flowers appear two or three weeks later and develop with the leaves. The flowers, although not so showy as those of *R. roseum*, are also sometimes offered for sale.

Rhododendron oblongifolium (Small) Millais. The flowers of this species are the last to open, often blooming as late as the middle of May. They are small, and although faintly tinged with pink in the bud, soon become

pure white. This is a species of sandy bogs and is restricted to such places and to the vicinity of perennial streams.

Xolisma mariana (L.) Rehd. This little shrub, with its showy spikes of small bell-shaped flowers, is a species of the coastal plain, but is sometimes found near streams along the margins of the Ozark region. It was collected here in wet ground along a small creek about two miles south of Hot Springs.

Xolisma ligustrina (L.) Britton. Male-berry. Found in sandy bogs and along the borders of perennial streams.

Xolisma ligustrina var. *foliosiflora* (Michx.) Mohr. Grows with the typical form, from which it differs in the leafy flowering panicles.

Vaccinium arboreum Marsh. Tree Huckleberry. This species sometimes becomes a small tree but is more commonly a stout shrub. It is common in many places on the mountains and in dry rocky ground in the valleys.

Vaccinium stamineum Ait. High-bush Huckleberry. This species is common in open rocky woods and glades, especially on the mountains. The bushes are often a meter to a meter and a half tall. The fruit is of good size and quality and is often gathered by the country people and sometimes sold on the market.

Vaccinium corymbosum L. Swamp Huckleberry. This tall shrub, which is sometimes three meters in height, is a species of the coastal plain, and is found here only in the small sandy bogs along creeks. The fruit is edible but the plants are not common enough here for it to be of much importance.

Vaccinium vacillans Kalm. Mountain Huckleberry, Low Huckleberry. This is a low shrub of the rocky woods and mountain sides. The stems and branchlets are green and glabrous. It fruits abundantly but is much less common than the following variety.

Vaccinium vacillans var. *crinitum* Fernald. This is the common low Huckleberry of the Ozark region, and it is often very common here, especially on the mountains. The fruit ripens earlier than in the other species, and the berries, although small, are in great profusion, and are gathered and sold in large quantities.

Vaccinium virgatum Ait. Found in sandy bogs and moist rocky ground along streams. The slender erect bushes are sometimes nearly a meter in height, and the abundant fruit is small but edible.

Vaccinium virgatum var. *speciosum*, var. nov.¹ This variety, which was found on rocky open banks near High Point, and also more abundantly along a small branch about two miles south of Hot Springs, differs from the typical form in having the flowers in terminal spikes 10-15 centimeters long, closely congested or but slightly interrupted. The flowers, which are of a delicate pink color, are also slightly larger than in the typical form, the corollas being from 8 to 10 mm. in length. The plants seen

¹ *Vaccinium virgatum* var. *speciosum*, var. nov. A typo recedit floribus paulo majoribus, inflorescentiis dense racemosis.—Frutex erectus gracilis, circiter 5-8 dm. altus.

were from 5 to 8 decimeters tall, slender and but little branched. It is the handsomest of all the native *Vacciniums* in flower, and would be quite ornamental in cultivation. The type specimens are my numbers 24548, High Point, April 25, 1924, for flowers, and 37127, Hot Springs, May 10, 1925, for fruit.

EBENACEAE

Diospyros virginiana L. Persimmon. Rather frequent on borders of woods, especially in the rocky creek valleys. There is considerable variation in the size, quality and time of ripening of the fruit here, as throughout the region. One tree found on the rocky banks of Gulpha Creek about half a mile below the railroad bridge, had leaves and branchlets densely and permanently fine hirsute. In the pubescence of the leaves it resembles extreme forms of the var. *platycarpa* Sarg., but not in their small size or in the small fruit. Specimens with similar foliage were collected by Mr. B. F. Bush, near Greenwood, Missouri, a few years ago. The Missouri plants, however, were mostly small shrubs, while this is a tree 12 or 15 meters tall. This should perhaps be distinguished as a variety, but I hesitate to do so until it is better known.

SAPOTACEAE

Bumelia lanuginosa (Michx.) Pers. This small tree, called Gum Elastic in the South, is rather frequent here in rocky ground along bluffs and streams.

STYRACACEAE

Styrax americana Lam. Storax. This shrub is usually a denizen of low swampy ground, but it is growing here along the rocky margins of the Ouachita River, where it is subject to frequent inundation or overflow.

Styrax grandifolia Ait. This handsome shrub is found in the rocky valleys of some of the mountain streams, and it sometimes also grows on rocky bluffs. The flowers are much larger than in the last species, and are in great profusion. The plants are usually 1 or 2 meters high, but some specimens seen in the valleys reached a height of five or six meters and were really small trees.

Halesia monticola var. *vestita* Sarg. Silver-bell Tree. Seen only along the Ouachita River, where it is not common. Although it becomes a good sized tree in the southern Appalachians, it is usually only a shrub here, from 2 to 4 meters tall. The flowers, at first green, become pure white when fully grown and are very handsome.

OLEACEAE

Fraxinus americana L. The White Ash is rather abundant in the valleys and is sometimes also found on mountain sides.

Fraxinus pennsylvanica var. *lanceolata* (Borkh.) Sarg. Green Ash. Found only in moist or alluvial ground in the valleys of the larger streams.

APOCYNACEAE

Trachelospermum difforme (Walt.) Gray. This slender woody vine is rather abundant in wet ground along streams.

BIGNONIACEAE

Campsis radicans (L.) Seem. Trumpet Creeper. This stout woody vine is abundant in thickets and low woods along the larger streams. It is often a high climber on trees, but in open ground sometimes prostrate or appearing shrubby.

Bignonia capreolata L. Cross Vine. This handsome vine grows in situations similar to the last, but is less common. It is a high climber on trees.

Catalpa speciosa Warder. This species and also *Catalpa bignonioides* (L.) Karst. were found growing in waste ground in the valley of Hot Springs Creek, where they have been introduced from seeds spreading from cultivated trees.

RUBIACEAE

Cephalanthus occidentalis L. Button-bush, Button-Willow. Found in sandy bogs and in low ground along the larger streams.

CAPRIFOLIACEAE

Sambucus canadensis L. The Elder or Elder-berry Bush is found in rich alluvial ground along streams.

Symphoricarpos orbiculatus Moench. Buck-brush, Coral-berry. Sometimes found in thickets, especially in the creek valleys, but nowhere common.

Viburnum prunifolium L. Black Haw. This species of the Northern and Eastern States was noticed in several places along the small creeks, but it is not common here.

Viburnum rufidulum Raf. This southern species is much more abundant than the last, from which it is not distinguished by the general public. It is found in thickets and open rocky woods, and sometimes becomes a small tree. The fruits of this and the last species are edible and are often gathered by children.

Viburnum nudum L. This Coastal Plain species is found here only in the small sandy bogs along the mountain streams, where it is sometimes locally abundant. The small blue berries are inedible and disagreeably scented.

Lonicera flava Sims. Yellow-flowered Honeysuckle. Common along bluffs of streams and rocky ledges on the mountain sides.

Lonicera sempervirens Ait. Trumpet Honeysuckle. This pretty species is found in thickets along the small stream valleys.

Lonicera japonica Thunb. The Japanese Honeysuckle is abundant as an escape from cultivation in the vicinity of Hot Springs, and it may well become a troublesome weed here, as it has in many places in the Southern States.

LEAVES FROM A COLLECTOR'S NOTE BOOK

ERNEST J. PALMER

Milwaukee, Wisc., Sept. 17th, 1925

This afternoon Mr. Teuscher and I, guided by Mr. Fuller of the Milwaukee Public Museum, visited the sand dunes along Lake Michigan, about three miles south of Sheboygan. These are the most extensive dunes we have seen on the west shore of the lake. In places the sand deposits must extend more than half a mile back from the shore, and we followed them for more than a mile along the lake front. The fine sands are heaped up in mounds and ridges or hollowed out in troughs and depressions, characteristic of such aeolian deposits. Beds of coarse gravel underlie the sand, as is shown in deep pits from which it has been in places removed. Near the shore and in the more unstable parts of the dunes, plant growth is sparse and consists of a few species of typical sand plants, mostly annual herbs and perennial sedges and grasses. *Cyperus Schweinitzii* Torr. and *Amnophila breviligulata* Fernald are at this season amongst the most conspicuous; *Cakile edentula* Hook., *Euphorbia glyptosperma* Engelm. and *Lathyrus maritimus* Bigel. are also common in such places. *Selaginella rupestris* Spring is found in depressions and *Cirsium undulatum* Spreng. in the higher parts of the dunes. The woods and thickets bordering the dunes are made up of a great variety of deciduous trees and shrubs and several Conifers. Along this border there is the usual constant struggle going on between the encroaching sands and the more hardy of the forest plants. The most abundant Conifers are *Pinus Strobus* L., *Thuja occidentalis* L. and *Picea mariana* B.S.P. In the deep sands the woody part of the flora is often limited to a few species of shrubby Willows and two low growing Junipers; *Juniperus communis* var. *depressa* Pursh is frequent and *Juniperus horizontalis* Moench. covers large areas. This last named species is growing here to great perfection and is a very striking plant. It forms in places a perfect ground cover, almost as thick as grassy turf, the little branchlets ascending to a height of only a decimeter or so above the prostrate main branches. These mat-like expanses are often many meters in extent, apparently having originated from single plants or from only a few individuals.

In some of these colonies a curious variation has arisen: ascending from the prostrate or creeping branches are erect tree-like growth with fascicled branchlets and dense acicular foliage. These upright growths are often two to three decimeters or more in height, and they present a striking contrast to the normal prostrate parts of the plants. Where they are common, as in some colonies we saw, they suggest a pygmy forest with a dense undergrowth of shrubs or vines. There was no fruit on any of the erect branches, although it was abundant on many of the prostrate ones. This form, which appears to be merely a monstrosity, seems to be identical with the plants recently described by Mr. Alfred Rehder (in

Jour. Arnold Arb. vi. 203 [1923]), as *Juniperus horizontalis* f. *alpina*, from plants cultivated at the Arnold Arboretum and received there from the Ellwanger and Barry nursery, Rochester, New York. The occurrence of this curious form as a native plant at the Wisconsin locality is interesting, since nothing is known as to the origin of the cultivated plants, which were first grown in English gardens.

Webb City, Missouri, Oct. 5th.

Today Mr. B. F. Bush and I, starting from Baxter Springs, Kansas, explored some high limestone bluffs along Spring River, following them for several miles down stream to a point a short distance beyond the Oklahoma state line, where they terminate in an alluvial bottom. In the rocky woods near Baxter Springs we found *Quercus velutina* var. *missouriensis* Sarg. and also fruiting specimens of *Ilex decidua* Walt. The latter is a southern species which barely gets into the state in this southwestern corner. *Bumelia lanuginosa* Pers. is fairly abundant, and last year I found some small specimens of *Sapindus Drummondii* H. & A. along the bluffs. Both of these, however, although they are typical trees of the Southwest, extend for some distance farther into Kansas. The three species of *Vaccinium* found here are also restricted to this corner of the state: these are *Vaccinium arboreum* Marsh., *V. vacillans* Kalm and *V. stamineum* Ait. Near the end of the bluff we found several small trees of *Ulmus alata* Michx., a species which I believe has not yet been found in Kansas, and we at first thought that we had secured evidence of an interesting addition to the tree list of the state, but inquiry from a farmer in the vicinity, later confirmed by consulting the topographical map, proved that they were really growing a few hundred yards south of the state line, and in Oklahoma. There can be little doubt, however, that scattered specimens might be found near here, within the borders of Kansas.

Fulton, Arkansas, Oct. 30th.

The autumn coloring of the Ozark and southern forests has been unusually brilliant this season. Following a dry summer, rains began late in September and have been so frequent and heavy during the past four or five weeks as to do much damage to highways, railroads and standing crops. Light frosts occurred during the second week of September in southern Missouri and northern Arkansas; tender herbage was killed over the northern tiers of counties in this state on September 13th, and on Thursday night (Oct. 29th) there was a light fall of snow, flurries being recorded as far south as Little Rock. This combination of drought succeeded by cool rains and premature frosts has doubtless hastened and accentuated the process of transforming the uniform green of the summer landscape into the multi-colored gorgeous robes which it now wears.

There appears to be much variation in the colors assumed by the leaves of plants, even within the same species, and these differences cannot readily be accounted for on ecological grounds, since specimens standing

in close proximity sometimes display a marked contrast. This is noticeable in many of the Oaks, Maples, Sassafras, Sweet Gum and various members of the Rosaceae. The Hickories seem to be amongst the least variable, always, so far as I have observed, assuming some shade of yellow before becoming bronzed by the late frosts; the Elms regularly assume similar colors, as do also the Mulberry and Sycamore. The Sumacs, Dogwoods and Black Gum seem equally partial to the brilliant shades of red; the last (*Nyssa sylvatica* Marsh.) is one of the most uniformly as well as most gorgeously colored trees of the autumn forest. When seen at its best in bright sunlight it is often of a rich scarlet or brilliant crimson color, that can be compared only to the tints sometimes seen in a waning sunset, and which no artist's brush can imitate.

The Sweet Gum (*Liquidambar Styraciflua* L.) is also often splendidly colored at this season, and its foliage shows, perhaps, the greatest diversity in coloring of any of our forest trees. The color most commonly seen is some shade of red, but on many trees the leaves early turn to a pale yellow, which may gradually deepen to orange or become flushed with pale crimson. Sometimes in a single group trees of these shades may be found growing closely associated with others in which the leaves are of a brilliant crimson or dark crimson-purple color; in some cases it becomes almost a black-purple, which is the darkest color I have ever seen in the leaves of any American tree. Again, in the same group some trees may be found in which the leaves have remained quite green, or the curious phenomenon is often observed of some part of the tree, or perhaps a single branch, being brilliantly colored while the foliage of the rest of the plant remains green. Such contrasts in coloring in a single plant are quite striking, but are more easily accounted for than are the differences in colors of entire trees growing together under apparently identical conditions; for in the case of the prematurely discolored branches it is doubtless due to an injury, or to some cause that has partially impeded the sap circulation.

Today, near Fulton, I observed such a case: on a tall pyramidal tree, about 25 or 30 meters in height, a single branch not far from the base of the crown stood out on account of its dark purplish-crimson color from the green foliage of the rest of the tree. Several small saplings near by were also still green, but on one medium sized tree not more than 20 meters away, all of the leaves had turned bright red. It is interesting to note in this connection that woodsmen and lumbermen in the South often insist that there are two distinct varieties of this tree, which, they distinguish as Sweet Gum and Red Gum; the wood of the latter, it is claimed, is of a superior quality and of a deeper color; and it is this variety that furnishes the lumber used extensively for furniture and for interior decorations under the trade name of "Circassian Walnut." Botanists have been unable to discover any morphological differences by which these supposed varieties can be distinguished.

This afternoon, after spending most of the day in the sand hills about

McNab I got into a bit of low woods along Yellow Creek. The soil here is a black gumbo or stiff clay; the surface is flat and subject to frequent overflow, but is not swampy for the most part, and in summer and autumn it often becomes very dry. Characteristic trees are *Carya myristicaeformis* Nutt., *Quercus Shumardii* Buckl., *Ulmus crassifolia* Nutt., *Sophora affinis* Torr. & Gr. and *Sapindus Drummondii* Hook. & Arn. This is the only locality in the state where I have found either of the last two species abundant. There are many specimens of *Sophora*, some of them being 10 or 12 meters in height. The *Sapindus* is even more abundant; I estimate the largest trees to be over 15 meters in height and 3.5 decimeters in trunk diameter. Both were fruiting abundantly.

Crossing or rather wandering through the woods I came out on the shore of Grassy Lake. This is a body of shallow water, or during most of the year and over much of its area, marsh land, fed and drained by Yellow Creek. It also receives the drainage from the higher ground on the north through several small streams and seeping springs. The lake, in its main axis, from southeast to northwest, is about one and a half miles long, and its area is something over two square miles. The past summer has been unusually dry, causing most of the water to disappear from the lake.

I walked for some distance across mud flats, over which were scattered thousands of dead mussel shells, mostly of a large species of *Anodonta*; and there were also many carapaces of turtles of two or three sorts. It is said that the deeper parts of the lake abound in alligators, and some large ones have been killed or captured during the present drought, as they can be seen readily when they come up from their "wells" to breathe or forage.

I made towards a group of tall Cypress trees (*Taxodium distichum* Rich.) in the hope of securing some seeds which were wanted for planting; but few of the trees seemed to be bearing cones, and those I saw were too high to reach and had not yet begun to fall. However, there were thousands of fine young seedlings coming up all about the grove. These were evidently from last year's seeds and were from one-half to three and a half decimeters in height. Apparently the seeds of this tree germinate only when the cones fall in mud or shallow water, where they can become thoroughly saturated; then after the water recedes or if the mud does not dry too quickly, the seeds begin to germinate under the action of the hot sun. Earlier in the season I observed this also near Monroe, Louisiana, where countless young seedlings were springing up along the muddy margin of a retreating bayou.

Evidently at this southeastern end of the lake the water is never of much depth and does not at any time cover all of the surface, for besides the occasional groups of Cypress and other scattered trees, there are many clumps of *Cephalanthus occidentalis* L., *Cornus stricta* Lam. and other shrubs, and on hummocks and about old stumps and logs are growing

tussocks of tall swamp grasses and sedges and a variety of weeds. The Composite vine *Mikania scandens* Willd. is very abundant and is conspicuous now on account of the fluffy white pappus of the achenes, released by the recent frosts. Amongst trees growing here, besides the Cypress, I noted the Black Willow (*Salix nigra* Marsh.), Swamp Hickory (*Carya aquatica* Nutt.), Overcup Oak (*Quercus lyrata* Walt.), Water Elm (*Planera aquatica* J. F. Gmel.), Swamp Honey Locust (*Gleditsia aquatica* Marsh.) and Green Ash (*Fraxinus pennsylvanica* var. *lanceolata* Sarg.).

A steady drizzling rain had been in progress for some time, making the walking slippery and the weeds and shrubs very wet. Seen under these conditions through the fog and mist it would be hard to imagine a more dismal landscape. The tangle of bushes and vines about the margin of the lake became in places quite impenetrable, but there were some open spaces where pools had been, and various paths or channels, some of which ended in blind alleys. Picking my way through these I soon lost all sense of direction, and as the rain was becoming heavier, with no sort of shelter in sight, and evening approaching, it occurred to me that it would not be a very desirable place in which to spend the night. I happened to have a compass with me, by the aid of which I steered a course as directly south as the difficult going permitted, and in a short time I was relieved to find myself again on the banks of Yellow Creek, which I followed down to the railroad, and after a four miles further tramp reached Fulton sometime after dark.

Many of the Hickories and some Oaks are not fruiting this year, due to late frosts which occurred at the time the trees were flowering in March and April. In southern Missouri and northern Arkansas scarcely any nuts are to be found and even so far south as Fulton the crop is very short; of the many Hickory trees I noticed today perhaps less than twenty-five per cent had any fruit. In the upland woods south of McNab I found a tree of *Carya alba* var. *ovoidea* Sargent, of which I secured herbarium specimens and fruit. The nuts are identical in shape with those of the type tree of this variety, which was found at Noel, Missouri. This appears to be rather a rare form, and it is the first time I have seen it in Arkansas. It is also interesting as another addition to the long list of woody plants found in the Fulton region. Since publishing the list in the Journal of the Arnold Arboretum for January, 1923, I have made several other trips to this remarkable locality and have found a number of woody species not then known to occur here. For the sake of completeness the following should be added to the list:

Yucca glauca Nutt. Growing in sandy fields and open woods near McNab.

Salix longifolia Muhl. Banks of Red River, near Fulton, and also along small creeks near McNab. It is growing here as a shrub up to 3 or 4 meters in height.

Carya alba var. *ovoidea* Sarg. Upland woods near McNab, as noted above.

Quercus stellata var. *araneosa* Sarg. In deep sands, on hillside near McNab.

Quercus obtusa Ashe (*Q. rhombica* Sarg.). Moist sandy banks of bridge Creek, near McNab.

Quercus rubra var. *leucophylla* Ashe. Growing with the typical form in upland woods near Fulton and McNab.

Quercus nigra var. *heterophylla* (Ait.) Ashe. In low woods near Fulton and McNab. This variety is sometimes well marked and is appropriately named, as the leaves are remarkably variable in size and lobing.

× *Quercus Rudkinii* Trelease. A tree which from the character of its foliage and fruit appears to be this hybrid (*Q. marilandica* × *Phellos*) is growing on the edge of a flat upland woods a short distance from Fulton. Both supposed parent species are abundant in the vicinity.

Philadelphus pubescens Loisel. On sandy north-facing banks of deep ravines, near McNab. This is the most southwestern station at which I have seen this handsome shrub.

Malus angustifolia Michx. Collected near McNab, where it is locally abundant on the edge of woods. Probably the plants found near Fulton and included in the original list as *Malus ioensis* var. *Palmeri* should also be included with this southern species.

Zanthoxylum americanum L. A specimen collected by B. F. Bush, at Fulton, is in the Arnold Arboretum herbarium. I have not seen it so far south.

Vitis vulpina L. In low ground along Red River, near Fulton.

Opuntia humifusa Raf. This low-growing species of Prickly Pear may be added to the list, if it is to be regarded as a woody plant, since it is found frequently in clay barrens.

Vaccinium Elliottii Chapm. In low sandy woods near McNab.

Bumelia lycioides (L.) Gaertn. Several small trees, with ripe fruit, were discovered in low woods along Yellow Creek, in October, 1924.

Viburnum nudum L. A specimen of this species, collected by B. F. Bush, and labeled from Fulton, is in the herbarium of the Arnold Arboretum. It probably came from the sandy bogs near McNab, as it is abundant in such situations near Texarkana.

Several other woody plants have been reported as occurring near Fulton, but which I have not yet been able to confirm by personal observation or examination of specimens. Further exploration will doubtless add to the above list.

Ft. Worth, Texas, Oct. 31st.

The Trinity River, which in southern Texas becomes an imposing stream, is here little more than a large creek, and in dry seasons one can walk across its rocky bed at many places without danger of wetting the feet. The banks and immediate vicinity of the stream were originally wooded with a growth of moderate sized deciduous trees. Most of this has been cleared away now, but fortunately the City of Ft. Worth is preserving

a considerable tract on the right or south bank of the river, under the name of Trinity Park. The forest growth consists principally of Pecan (*Carya pecan* Engl. & Graebn.), Bur Oak (*Quercus macrocarpa* Michx.), Texas Red Oak (*Q. texana* Buckl.), Cedar Elm (*Ulmus crassifolia* Nutt.), White Elm (*U. americana* L.) Winged Elm (*U. alata* Michx.), Red Mulberry (*Morus rubra* L.), Box Elder (*Acer Negundo* var. *texanum* Sarg.), Soapberry or Wild China (*Sapindus Drummondii* Hook. & Arn.), Buckthorn or Gum Elastic (*Bumelia lanuginosa* Pers.) and White Ash (*Fraxinus americana* L.). The Big-tree Plum (*Prunus mexicana* Wats.) Texas Green Haw (*Crataegus Reverchonii* Sarg.), Deciduous Holly (*Ilex decidua* Walt.), Rough-leaved Dogwood (*Cornus asperifolia* Michx.) and southern Black Haw (*Viburnum rufidulum* Raf.) are also abundant as small trees or shrubby undergrowth. Along the immediate banks of the river one sees the Black Willow (*Salix nigra* Marsh.), Cottonwood (*Populus balsamifera* var. *virginiana* Sarg.), Sycamore (*Platanus occidentalis* L.), Green Ash (*Fraxinus pennsylvanica* var. *lanceolata* Sarg.) and the Poison Ivy (*Rhus Toxicodendron* L.). Here I was surprised to find also the Dutchman's Pipe vine (*Aristolochia tomentosa* Sims.), climbing high in the trees, with an abundance of its curious hexagonal pods. Indeed, except for the paucity of species and the absence of many familiar plants, the woods here have quite a familiar aspect, judged by the standards of the eastern and middle-western states. This is in striking contrast to the xerophytic Sonoran flora that begins to appear on the limestone hills and mesas a short distance to the southwest. One is reminded, however, of the proximity of this western flora by coming upon a few representatives of it here. The Mesquite (*Prosopis juliflora* DC.) is appearing on prairies and *Sophora affinis* T. & G. in open woods. On the river banks the Mustang Grape (*Vitis candicans* Engelm.) is abundant, and I also found here *Solanum triquetrum* Cav. and *Rivina humilis* L. But the most interesting tree I have seen is the western Walnut (*Juglans major* Heller), of which two or three small trees were seen in the park and two medium sized specimens, the larger being perhaps 10 meters high, on the banks of the river about a mile farther down. There was not much fruit on the trees this year, but enough to verify the identification. This species differs from its close relative, *Juglans rupestris* Engelm., in its larger nut, which is sometimes 2.5 to 3 centimeters in diameter, and in the fewer and broader leaflets. This locality is much farther east than I had previously seen it and far beyond the range given in the manuals.

In going back through the park I picked up some acorns of the Bur Oak, which were of unusual size and form. The cups are broadly bell-shaped or almost basin-like and much depressed, as are also the nuts. The fringe of the cups is remarkably developed, the band being more than two centimeters thick above. The total diameter of the largest specimen taken is eight and its height four and a half centimeters. I remember collecting a similar form near San Saba, Texas, along the river of the same name, a few years ago.

Little Rock, Arkansas, Nov. 7th.

A short time ago, in going from Texarkana to Hot Springs on the Missouri Pacific railroad, I noticed some plants of what appeared to be the Sweet Bay (*Magnolia virginiana* L.) in a bit of swampy woods a few miles south of Malvern. As I had not previously found this plant so far north in the state I resolved to come back at the first opportunity and investigate it. This morning I left Hot Springs in the rain, which has continued most of the time for several days; and while waiting to transfer in the station at Benton there was a very heavy downpour. When I reached Malvern it was still raining, but fortunately only in light showers. As I planned to get to Little Rock to-night I changed clothes and checked my baggage in the station and after getting lunch set off about noon to walk down the railroad. After walking between three and four miles I saw the first signs of the plant I was in search of—some sprouts coming up from stumps of trees that had been cut down along the railway. Water was standing everywhere on the lowlands and wide ditches on both sides of the elevated track made it difficult to get out into the woods. After going over half a mile further looking for better specimens and a more convenient place to cross I saw some good sized trees a little way back from the railroad, but was less successful in the latter object, not even being able to discover an old tie or log that might serve as a bridge across the ditch. As it was too wide to jump and I did not propose to return without the specimens, wading seemed to be the only alternative; so taking off my boots and stockings and rolling up my trousers I crossed at a point where the water proved to be little more than knee-deep. Once across the ditch it was necessary to put on the boots again on account of briars and snags, but in going into the swamp the water was over boot tops in places. Under these circumstances I was satisfied with a rather brief exploration. There are many good sized trees of the *Magnolia* here, some I should judge to be ten or twelve meters tall. They grow in the deeper parts of the swamp, most of which is probably permanently boggy and all under water at present. *Ilex opaca* Ait., *Viburnum nudum* L. and *Itea virginica* L. were growing in similar situations, and on little elevations or knolls *Myrica cerifera* L., *Rhododendron oblongifolium* Millais, and *Chionanthus virginica* L. were abundant. I hope at some more favorable time to be able to explore this bog more thoroughly.

Blue Mountain, Arkansas, Nov. 8th.

Traveling today over the Rock Island railroad from Little Rock to Blue Mountain I had an opportunity to observe again the Red Maple (*Acer rubrum* var. *tridens* Wood.), which is often abundant in low woods along the Arkansas River and along smaller rocky streams. The foliage of this tree here is in nearly all cases turning to some shade of yellow, similar to the tints assumed by the Sugar Maple (*Acer saccharum* Marsh.), and only rarely is one seen with leaves of the bright red colors usually asso-

ciated with the species, and which has given it generally the popular name of Red Maple. On most of the trees the color is now pale yellow; in some cases it is passing into orange or is tinged with a delicate pink or pale crimson; one tree was noted of a brilliant crimson color. It was, of course, impossible to determine from the train whether the trees were of the variety with trident leaves or of the typical form, but the former is much the commoner here and the typical form is in most localities entirely absent. The northern Sugar Maple is not found in this part of the state. About two weeks ago, going from Little Rock to Hot Springs on the Missouri Pacific railroad, I noticed similar coloring in hundreds of specimens of the Red Maple, and later in walks about the Hot Springs region was able to observe them at closer range and to confirm the determination. Practically all trees seen in that vicinity were of the variety mentioned above.

It has turned clear and cold to-night after the long continued rains, and there will probably be ice in the morning. Tomorrow I plan to spend on Magazine Mountain.

Poplar Bluff, Missouri, Nov. 14th.

In the autumn of 1921, while collecting in the hills just outside of Poplar Bluff and to the west of the town, I came upon several trees that I identified as *Quercus coccinea* Muench. There was no fruit on most of the trees that season, and I had to be content with examining the cups of acorns of the previous year, but these in connection with the herbarium specimens made, convinced me that I had found the Scarlet Oak of the eastern states, concerning the occurrence of which to the west of the Mississippi, at least as far south as Missouri, I had previously been in doubt. This tree, which is so well known in the region where it grows on account of the brilliant red color of its autumn foliage, has often been reported from the Trans-Mississippi region, the identification perhaps being based on no better character than the color of the autumn leaves. Most of the large herbaria contain specimens labelled *Q. coccinea* coming from the central-western and southwestern states, but for many of them which I have seen the determination is very doubtful or certainly wrong. The mistake is due to the fact that the leaves of certain individuals of other species of the Red Oak group assume a similar autumn coloring.

Today I relocated the trees found in 1921, and also found many others. The locality is along the margins of the low hills of Tertiary clays and gravel that border the Black River valley in the western suburbs of the town. Most of the trees are well loaded with fruit this year; the leaves are generally of a brilliant crimson color, varying somewhat in shade on different trees. An examination of the fruit, together with the leaves and the winter buds, which are now well developed, can leave no doubt as to the identity of these trees. The commonest form here seems to be the variety in which the scales of the fruiting cup are much thickened at their bases and somewhat indurated, giving the cup a very rough tubercled appearance and a firm polished surface, as though the whole

were carved from hard wood; this is *Quercus coccinea* var. *tuberculata* Sarg. On some trees the cup scales are looser and slightly puberulent, as in the typical form of the eastern states. The winter buds are rather large, full and rounded at the apex, with scales finely puberulent at their tips.

It is interesting to note that Mr. B. F. Bush appears to have also found a tree of this species, a short time ago, near Montier, Shannon County. I have seen specimens of fruit and leaves from this tree, and there can scarcely be any doubt that it is *Quercus coccinea*. There are also two specimens in the herbarium of the Arnold Arboretum, collected by Mr. J. H. Kellogg, near Jerome, Phelps County, which have been referred to this species. This seems to definitely establish the fact that the Scarlet Oak is found in Missouri, although it appears to be a comparatively rare species and, so far as we know now, confined to a few localities in the southern and southeastern parts of the state.

NEW SPECIES, VARIETIES AND COMBINATIONS FROM THE HERBARIUM AND THE COLLECTIONS OF THE ARNOLD ARBORETUM¹

ALFRED REHDER

Cedrus libanotica Link, Handb. II. 480 (1831).

Cedrus libanotica Trew apud Pilger in Engler & Prantl, Nat. Pflanzenfam. ed. 2, XIII. 329 (1926).

The complete synonymy of this species will be found on p. 205 of the preceding volume of this Journal with the exception of the name now taken up by Pilger. I can, however, not follow Pilger in considering the name *C. libanotica* Trew a valid binomial. Trew's book "*Cedrorum Libani historia of 1757*" is nomenclatorially a prelinnean publication; he does not use binomial nomenclature and even when he cites (p. 7) from Linnaeus' *Species plantarum* he omits the "nomen triviale" and cites "*Pinus foliis fasciculatis acutis* Linn. Sp. pl. 1001, n. 6," which clearly shows that he has no intention to use binomials. Also, when he enumerates (p. 7-8) the Conifers he examined and compared with *Cedrus*, he cites: *Larix folio deciduo conifera*, *Abies Taxifolio sursum spectante*, etc. The binomial credited to him by Pilger is contained in a sentence on p. 4, which reads: "*Tab. prior Cedri Libanoticae totus habitus secundum unam ex Chelseanis maioribus delineatus.*" It is evident that this is only a colloquial designation for the Cedar of Lebanon and not intended as a name proposed for this tree. He does not mention this name, on page 4 and 5 where he enumerates all the names applied to the Cedar of Lebanon with references to literature, nor does he use this name anywhere else in his treatise. Such accidental binomials in publication by authors who did not accept binomial nomenclature have been rejected in other cases, as e. g., the name *Alnus*

¹ Continued from vol. VII. p. 37.

vulgaris which was used in 1756 by Hill in his British Herbal, a work in which Hill had not yet adopted binomial nomenclature; this name is therefore to be considered as belonging to prelinnean nomenclature and should not replace *A. glutinosa* (L.) Gaertn. of 1790 (*Betula glutinosa* L. of 1759).

× *Corylus Vilmorinii* (*C. avellana* × *chinensis*), hybr. nov.

Arbor pyramidalis trunco fere ad basin diviso (semper?) ramis erecto-patentibus; ramuli pubescentes, plus minusve glanduloso-setosi, rubrofusci, vetustiores fusci vel cinereo-brunnei. Folia obovata vel late elliptica, 5–13 cm. longa et 3–9 cm. lata, vix inaequilatera, subito breviter acuminata, basi cordata vel subcordata, duplicato-serrata, vix vel leviter lobulata, supra laxe pubescentia, subtus molliter pubescentia; petioli 0.5–2.5 cm. longi, pubescentes, pilosi et glanduloso-setosi. Amenta mascula 2–4 in ramulis 1–3 cm. longis, ad 9 cm. longa, bracteis conspicue acuminulatis mucrone glabrescente. Fructus 2–6 aggregati; involucrem pubescens et glanduloso-setosum, nucem superans, tubulosum, sed interdum uno latere ad basin vel ad medium fissum, supra nucem vix vel leviter constrictum, 2.5–3 cm. longum, triente superiore vel fere ad mediam in lobos dentatos vel laciniatos suberectos fissum, parte tubulosa nucem subaequante; nux subglobosa, circiter 1.5 diam., interdum paullulo altior quam lata, hilo carpico tertiam vel vix tertiam partem nucis aequante, pericarpio 1.5–2 mm. crasso.

Cultivated at the Arnold Arboretum under no. 7549 (received as plant from M. de Vilmorin in 1911 under no. 1200); specimens in herbarium: September 1919, August 18, 1921, April 7, 1922, September 23, 1925.

This tree received from M. de Vilmorin as a plant in 1911 under the name *Corylus chinensis* and under number 1200 was apparently raised from seed of the tree numbered 1200 in Vilmorin's Fruticetum at Les Barres. From this tree I collected myself in September, 1911, fruiting specimens which show clearly that it is true *C. chinensis* Franch. The tree, however, in this Arboretum, supposed to be the same, though resembling *C. chinensis* in habit and also somewhat in foliage, differs considerably in its fruits which exhibit characters pointing to the influence of *C. Avellana* L.; also the other characters of the plant confirm this supposition and leave little doubt that the tree represents a hybrid between *C. chinensis* and probably *C. Avellana*. The influence of *C. Avellana* is indicated by the smaller, broader, more sharply serrate leaves; less unequal at base and more abruptly acuminate, by the shorter tube of the involucre, little constricted above the nut and occasionally split to the base, and with longer more lacinate and dentate lobes, and by the larger and higher nut with a smaller shield and thinner shell. Though there is no proof that *C. Avellana* is the other parent, the short occasionally split tube of the involucre indicates that the second parent could not have been a species with a tubular involucre; the size, shape and the thin walls of the nut exclude *C. Colurna* L. and the involucre in its shape, dentation and

size has little resemblance to that of *C. americana* Walt. and *C. heterophylla* Fisch. which are apparently the only other species that might be considered, but it agrees much more with that of *C. Avellana*. For this reason I accept *C. Avellana* as the other parent, until the contrary is proved by experiment.

× *Corylus spinescens* (*C. avellana* × *tibetica*), hybr. nov.

Frutex ramis erectis; ramuli hornotini rubro-fusci, minute et sparse pilosi vel fere glabri, annotini et vetustiores fusco- vel purpureo-brunnei, luciduli, lenticellis conspicuis pallidis notati; gemmae ovatae, perulis glabris vel minute puberulis tenuiter ciliatis. Folia elliptico-obovata, rarius late obovata vel late ovata, 5–10 cm. longa et 2.8–7 cm. lata, subito acuminata, basi subcordata, argute dupliciter serrata dentibus acuminulatis in ramis robustioribus saepe leviter lobulatis, matura costa venisque subtus sparse pilosis exceptis glabra; petioli 5–15 mm. longi, sparse pilosi et interdum stipitato-glandulosi vel subglabri. Amenta mascula sub anthesi 5–6 cm. longa, bracteis fuscis subito acuminatis satis dense pubescentibus ciliolatis apice glabrescentia. Fructus involucri puberulum ad basin bipartitum, nucem vix superans, ad medium in lobos angustos laciniato-pinnatifidos laciniis linearibus vel subulatis rigidis spinosis fissum, in facie setis partim glanduliferis partim spinescentibus conspersum; nux subglobosa leviter compressa, circiter 1.5 cm. diam., paullulo latior quam alta.

Cultivated at the Arnold Arboretum under no. 19210 (plant received in 1911 from M. L. de Vilmorin); specimens in herbarium: December 5, 1921, March 6, 1922, September 23, 1925.

This Hazel had passed for *Corylus tibetica* which it resembles in general appearance until it bore fruit last autumn, when it became apparent that it was not true *C. tibetica* Batal. A closer examination showed that it was clearly intermediate between that species and *C. Avellana* L. and apparently a hybrid between these two species raised from seed gathered from a plant of *C. tibetica* in M. de Vilmorin's Fruticetum at Les Bares, France, whence our plant was received in 1911. From *C. tibetica* it differs in the leaves being smaller and, particularly those of vigorous shoots, broader and slightly lobulate with less elongated teeth, in the shorter petioles slightly pubescent and often stipitate-glandular, and in the involucre of the fruit which is not densely covered by long much-branched spines, resembling the burr of a chestnut, but is more like that of *C. Avellana* except that the ultimate divisions of the involucre end in rigid spiny points with additional spiny or partly gland-bearing bristles on the face of the involucre. From the latter species it further differs in the glabrescent and, particularly on the fruiting branches, narrower more or less elliptic leaves with closer and sharper serrations, in the dark red-brown branches with conspicuous pale lenticels and in the more acuminate scales of the staminate aments with glabrescent brown tips.

The plant in this Arboretum is a vigorous rather dense shrub now about 3 m. tall with upright branches and brighter and handsomer foliage than that of the common Hazel.

× *Clematis vedrariensis* var. *rosea*, comb. nov. (*C. chrysocoma* var. *sericea* × *montana* var. *rubens*).

Clematis Spooneri rosea Mottet in Rev. Hort. 1922, 214, t.; Arb. Arbust. d'Orn. 27 (1925).

This handsome *Clematis* which is according to Mottet a hybrid between *C. Spooneri* Rehd. & Wils. and *C. montana rubens* Ktze. raised in Vilmorin's nursery at Verrières, resembles in size and shape of its flowers the first named parent but differs in their rosy color. As I am following Schneider in reducing *C. Spooneri* to a variety of *C. chrysocoma* Franch. as *C. chrysocoma* var. *sericea* (Franch.) Schneid., this hybrid has to be classed with the hybrids between *C. chrysocoma* Franch. and *C. montana* for which the binomial is *C. vedrariensis* Hort. Vilmorin in Jour. Soc. Hort. France, ser. 4, xv. 385 (July, 1914) (*C. verrieriensis* Hort. Vilm. apud Gard. Chron. ser. 3, LV. 393, fig. 179 [June 6, 1914], without sufficient description). Though *C. verrieriensis* has priority by several weeks, I have adopted *C. vedrariensis*, as the latter name is accompanied by a full and detailed description, while the name *C. verrieriensis* was published without adequate description and with a very indifferent figure.

Ribes echinellum, comb. nov.

Grossularia echinella Coville in Jour. Agric. Research, xxviii. 71, t. 1 (1925).

FLORIDA.

As we do not consider *Grossularia* Adans. generically distinct from *Ribes* L., the new combination cited above becomes necessary. Through the courtesy of Dr. Coville this Arboretum has received herbarium specimens of this interesting new Gooseberry and also seeds from which plants were raised. How far north *R. echinellum* will be hardy remains to be tested, but it is to be expected that it will prove hardy much further north than its present distribution indicates, as *Ribes* and particularly the subgenus *Grossularia* is essentially a northern group.

+ *Pyronia Danieli*, comb. nov. (*Cydonia oblonga* + *Pyrus communis*).

Piroycydonia Danieli Hans Winkler apud L. Daniel in Compt. Rend. Acad. Sci. Paris, CLVII. 995 (1913); in Rev. Gén. Bot. xxvi. 312 (1914).

Pyro-Cydonia Danieli Guillaumin in Bull. Soc. Dendr. France, 1925, 63, t., fig. 4.

As I have stated already in this Journal (I. 262 [1919]) I am in favor of placing all forms intermediate between two distinct genera whether of sexual or asexual origin under one generic name. I see no advantage in segregating sexual hybrids and graft-hybrids between the same genera and in some cases even between the very same species under different generic names, though it seems advisable to distinguish sexual hybrids and graft-hybrids between the same species by different binomials. To indicate by convenient signs the origin, whether sexual or asexual, I propose to use the customary sign "×" for sexual hybrids and the sign "+" for graft hybrids.

The names *Pyronia* and *Piroycydonia* have been coined for hybrids between the same species, namely *Cydonia oblonga* Mill. and *Pyrus communis* L.: *Pyronia* for the sexual hybrid, *Piroycydonia* for the graft-hybrid.

As *Pyronia Veitch* was published first in 1911¹ while *Pirocydonia* Hans Winkler was not published until 1913² by L. Daniel, the latter should be considered a synonym of *Pyronia*. Under *Pyronia* there will be two binomials: *P. Veitchii* Guillaumin (in Bull. Soc. Dendr. France, 1925, p. 64) and *P. Danieli*; the former as the name for the sexual hybrids and the latter as the name for the graft-hybrids between *Cydonia oblonga* and *Pyrus communis*.

Another form of *P. Danieli* is the following:

+ *Pyronia Danieli* var. *Winkleri*, comb. nov.

Pyro-Cydonia Winkleri Daniel in Bull. Soc. Dendr. France, 1925, 63, t. fig. 5.

This form was obtained in 1913 by L. Daniel from the burr of an old tree of the Pear "Bon chrétien Williams" grafted on Quince; it differs from the original form obtained in 1902 in its smaller more pubescent leaves, conduplicate in bud, in the shorter petiole and in the fact that it grows readily from cuttings.

This and the preceding plant as well as *Pyronia Veitchii* var. *luxemburgiana* Guillaumin are represented in this Arboretum by young grafted plants.

Wistaria macrostachya Nutt. f. *albo-lilacina*, f. nov.

Wistaria frutescens c. *albo-lilacina* Dippel, Handb. Laubholzk. III. 694. (1893).

Wistaria frutescens rosea Hort. nonn. ex Dippel, l. c., as synon.

This *Wistaria* is enumerated by Dippel as a variety of *Wistaria frutescens*, but the plant cultivated at this Arboretum under this name is evidently a form of *W. macrostachya* Nutt. with pale lilac flowers.

Opuntia rhodantha var. *xanthostemma*, comb. nov.

Opuntia xanthostemma K. Schumann in Monatschr. Kakteenk. VI. 111 (1896);

Spaeth Kat. no. 98, p. 58 (1896) without adequate description; Gesamt-

beschreib. Kakt. 735 (1898).—Rehnelt in Gartenwelt I. 90, fig. (p. 83)

(1896).—F. W. Meyer in Garden, LVIII. 67, fig. (1900).—E. Wagner in

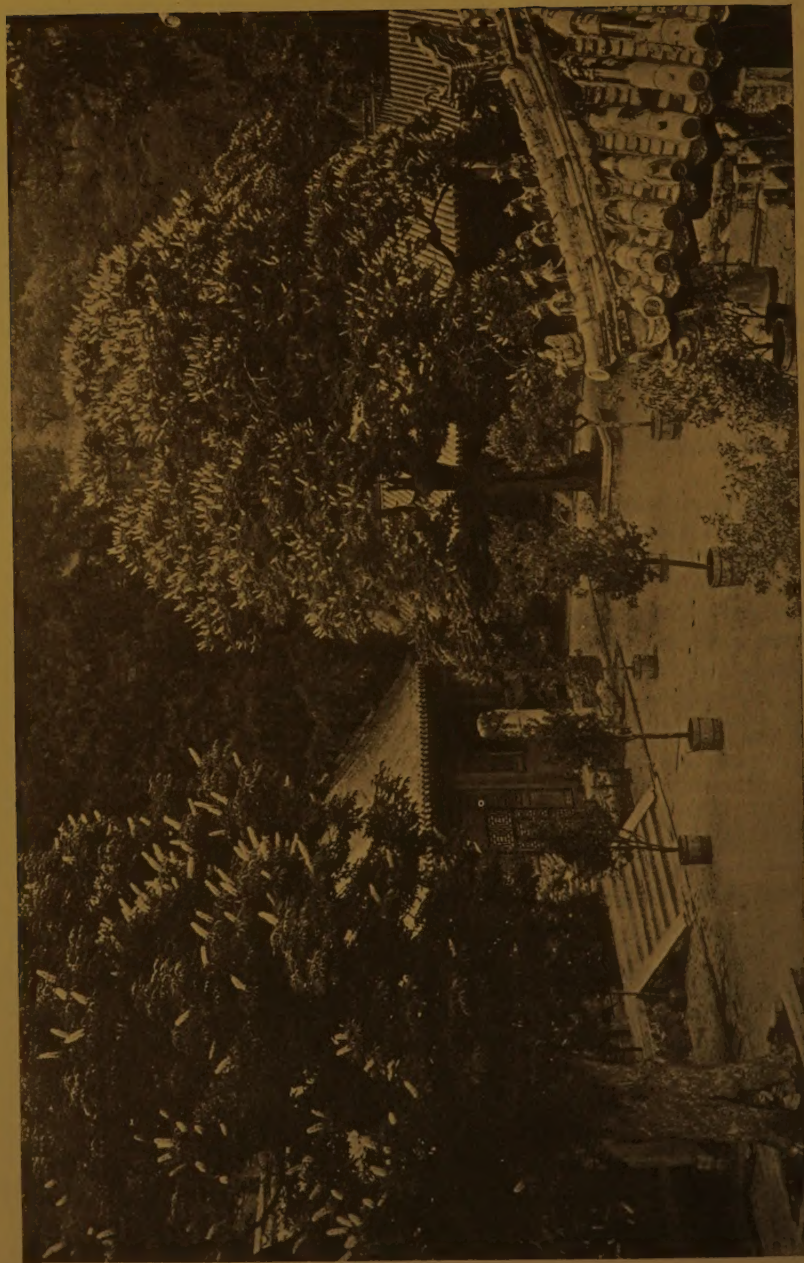
Monatschr. Kakteenk. XXX. 153, fig. (1920).—Nussbaumer in Gartenschönh.

IV. 123, fig. (1923).

This variety differs chiefly in its yellow filaments from the typical *O. rhodantha* K. Schum. which has carmine-red filaments and of which a colored plate was published in 1897 in Spaeth's Katalog, no. 100.

¹ Proc. Roy. Hort. Soc. XXXVII. p. xxxii (1911); XXXVIII. p. xxxiv. (1912); XL. p. clxxviii (1914).

² Compt. Rend. Acad. Sci. Paris, CLVII. 995 (1913). Through the kindness of Dr. Mansfeld in Berlin I received a note sent to him by Dr. Hans Winkler in which he states that he first proposed the name *Pirocydonia Danieli* in a letter written to Professor L. Daniel in 1913.



AESCULUS CHINENSIS BGE.
This tree is the one in the photograph near Peking